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E-book Usage in Swedish Universities

Patterns, Influencing Factors, and Student Perceptions

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Abstract:

This thesis investigates e-book usage among students in Swedish universities, examining patterns of adoption, influencing factors, and perceptions of accessibility and effectiveness. Despite standardised access to digital resources, student engagement with e-books remains uneven. To address this gap, the study applies the Technology Acceptance Model 2 (TAM2) as a theoretical framework and employs a mixed-methods approach, combining quantitative and qualitative data.

Data were collected in spring 2024 through an online questionnaire distributed to students at the University of Borås and Luleå University of Technology. A total of 86 valid responses were analysed. Quantitative data were examined using descriptive statistics, chi-square tests, and regression analysis, while qualitative responses were thematically coded to capture students' experiences and reflections.

The results show that laptops and PDFs dominate e-book usage, confirming earlier trends, but engagement is strongly shaped by institutional support, prior digital experience, and perceptions of usability. While many students valued the accessibility and convenience of e-books, barriers such as screen fatigue, usability challenges, and limited awareness of available collections were identified. Importantly, the study found no statistically significant differences in e-book engagement between undergraduate and graduate students.

Data collection relied on self-selection sampling, where students voluntarily participated in the online survey after being made aware of it through institutional and social media channels. The study concludes that effective integration of e-books into higher education requires more than broad access. It depends on strengthening digital literacy training, improving platform usability, and embedding e-books into teaching and research practices. Although constrained by a small and non-representative sample, the study contributes to Library and Information Science by offering updated insights into digital resource adoption in Swedish universities and highlighting strategies to support student learning in digital environments.

Keywords: E-books, Swedish universities, Technology Acceptance Model 2 (TAM2), digital learning, library services, student perceptions

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Contents

1. Introduction

The concept of a book has undergone significant transformations throughout history. From ancient palm leaves, clay tablets, and handwritten manuscripts to the invention of the printing press and, more recently, the rise of e-books, technological advancements have continuously reshaped the ways in which information is recorded and disseminated (Baron, 2015; Kurschus, 2015). An e-book is a digital system, consisting of both hardware and software, designed to present extensive textual content in a readable format while allowing users to navigate through the information efficiently (Borchers, 1999). In this study, an e-book refers to any digital reading material accessible through library platforms, including digital textbooks, scholarly monographs, open-access publications, and multimedia resources. This definition reflects the evolving role of academic libraries as key access points for digital knowledge.

The widespread adoption of e-books in higher education has been facilitated by advancements in computing, software, and internet technologies (Kont, 2016). As libraries have expanded their digital collections, e-books have become integral to academic learning. Between 2000 and 2020, the transition toward digital materials presented both opportunities and challenges for libraries, requiring them to balance print and digital collections while responding to student demands for seamless access (Kont, 2021). In Western academic institutions, e-books have gained significant traction, while their adoption in other regions continues to evolve, influenced by technological infrastructure and socio-cultural factors (Wallin & Maceviciute, 2014).

In Sweden, university libraries provide standardised access to e-books (Smith & Wideberg, 2017), yet student engagement with these resources varies. The reasons behind these variations remain unclear. Existing research suggests that information-seeking behaviour and students' perceptions of e-books influence their adoption and usage patterns (Xie & Matusiak, 2016). While younger individuals, particularly those aged 16 to 29, are more likely to engage with digital books, reading frequency tends to decline with age (Wallin et al., 2020). However, generational factors alone do not fully explain the differences in e-book usage among university students.

Prior studies highlight that several factors shape e-book adoption, including accessibility, usability, institutional support, and digital literacy (Lalwani et al., 2020; Shelburne, 2009). Additionally, students' academic disciplines influence their engagement with digital resources, with variations documented across fields such as humanities, social sciences, and engineering (Scullin, 2015; Huang & Chang, 2019). While research has explored these factors in various contexts, there is a lack of studies examining how these trends manifest within Swedish universities.

This study investigates e-book usage patterns, influencing factors, and student perceptions in Swedish higher education. While data is collected from students at the University of Borås and Luleå University of Technology, the study does not aim to compare these institutions directly. Instead, it seeks to explore general trends in e-book engagement and identify the

institutional and individual factors that contribute to variations in adoption. By addressing these gaps, this research provides insights that can help universities enhance digital learning strategies, improve e-book accessibility, and support students in making effective use of digital resources.

1.1 Problem statement

E-books have become an essential component of academic learning, offering flexibility, accessibility, and a vast range of digital resources. Despite the standardised framework of Swedish higher education (Deen, 2007; Kilimci & Riis, 2008) and equal access to digital materials across university libraries (Smith & Wideberg, 2017), variations persist in how students engage with e-books. Understanding these differences is crucial for optimising digital learning strategies, improving library services, and ensuring that students fully benefit from available resources.

While some students actively integrate e-books into their studies, others continue to favour printed materials. These differences may be shaped by various institutional and individual factors, including digital literacy, usability challenges, academic discipline, and personal preferences. Existing research highlights that information-seeking behaviour is influenced by both individual habits and external conditions (Xie & Matusiak, 2016), suggesting that even with widespread digital access, barriers such as limited awareness of e-books, difficulty navigating platforms, or lack of institutional support may hinder effective adoption (Fathi & Seif, 2017).

This study explores general patterns of e-book usage among university students and investigates the key factors influencing their adoption. While the research focuses on students at two Swedish universities - the University of Borås and Luleå University of Technology - the objective is not to compare these institutions directly but rather to identify broader trends in how students engage with e-books across different academic environments. Differences in disciplinary backgrounds, institutional support, and library infrastructures may all contribute to variations in e-book engagement.

Thus, the central research problem is:

Despite uniform higher education policies and standardised digital access in Sweden, why do differences exist in e-book usage among university students, and how can understanding these variations help optimise digital learning environments?

By examining usage patterns, identifying influencing factors, and assessing student perceptions, this study seeks to provide insights that can support universities in refining digital learning strategies, enhancing e-book accessibility, and fostering more effective use of digital resources.

1.2 Research aims and questions

This study seeks to:

- Examine e-book usage patterns among university students.
- Identify institutional and individual factors influencing e-book adoption.
- Assess students' perceptions of e-books as learning tools.

In this study, the term 'e-book usage patterns' is understood in a multidimensional sense, covering frequency of use, session duration, devices used, preferred file formats, language of e-books, and prior experience with e-books.

To accomplish these objectives, the study explores the following research questions:

1. What are the specific patterns of e-book usage among students at different universities?
2. What factors contribute to variations in e-book adoption?
3. How do students perceive the accessibility and effectiveness of e-books?

1.3 Scope of the study

This study focuses on students from two Swedish universities - University of Borås and Luleå University of Technology to understand how institutional differences influence e-book adoption. Unlike previous studies that primarily examine e-book access, this research investigates engagement patterns, barriers to usage, and students' digital learning experiences.

These two institutions were selected due to their distinct academic environments, library infrastructures, and disciplinary compositions. The University of Borås specialises in library and information science, fostering a strong focus on digital learning and e-resource adoption. In contrast, Luleå University of Technology emphasises engineering, technical sciences, and applied disciplines, which may influence students' attitudes and usage patterns of e-books. While the two universities provide access to e-books, their library infrastructures and academic orientations differ.

The study adopts a mixed-methods approach drawing on both quantitative and qualitative data collection and analysis, using survey data to analyse students' e-book usage patterns and perceptions. Due to sampling limitations, this research does not aim to establish a direct comparison between the two universities but rather to explore general trends and influencing factors.

Disposition

This thesis is structured as follows:

Chapter 1: Introduction

This chapter introduces the research topic, outlining the significance of e-book usage in university libraries and presenting problem statement, the study's objectives and research questions.

Chapter 2: Literature review

In this section, I review existing literature on e-book usage in academic settings, focusing on studies that explore usage patterns, student perceptions, and factors influencing digital resource adoption.

Chapter 3: Theoretical framework

This chapter outlines the theoretical perspectives that guide the study. It discusses relevant theories on technology adoption, digital resource usage, and student learning behaviours, forming the basis for interpreting the research findings.

Chapter 4: Methodology

This chapter describes the research design and methods used to gather and analyse quantitative and qualitative data. It explains the survey process, and data analysis techniques.

Chapter 5: Results

Here, the results of the quantitative and qualitative analyses are presented. Patterns of e-book usage, influencing factors, and student perceptions of e-books are discussed. Results of statistical data analyses are also discussed in this chapter.

Chapter 6: Discussion

This section interprets the findings in relation to the research questions and compares them with the existing literature. Regression analysis and hypothesis testing results are also discussed here. Theoretical implications, impact of methodological limitations and contribution to LIS research are discussed as well in this chapter.

Chapter 7: Reflections around the shortcomings of the questionnaire

Chapter 8: Conclusions

The final chapter summarises the key insights and draws conclusions based on the research findings. It discusses the implications of the study for enhancing e-book accessibility and integration within academic practices, reflecting on how these findings contribute to a deeper understanding of e-book usage among university students.

2. Literature review

2.1 Defining e-books: Characteristics, availability, and challenges in academic libraries

An electronic book (e-book) is generally described as a digital equivalent of a printed book, readable on various electronic devices such as computers, tablets, and e-readers (Gardiner & Musto, 2010). Rao (2003) categorises e-books as digital texts that can be accessed on multiple platforms. However, academic libraries tend to adopt a broader operational definition, including licensed digital textbooks, scholarly monographs, open-access publications, and multimedia resources (Nahotko & Deja, 2024). This study follows this broader definition to align with contemporary academic library collections. Swedish university libraries provide extensive access to e-books, yet institutional policies, licensing agreements, and digital literacy levels affect students' engagement (Maceviciute et al., 2014). For example, the University of Borås Library reports a collection of 499,455 e-book titles, but discrepancies exist in how universities count and classify e-books. This study acknowledges these variations to ensure clarity in analysing e-book usage patterns.

Although academic libraries have extensive experience in providing e-journals and e-books, they still face several challenges. One major issue is the limited availability of e-book titles, making it difficult for libraries to develop comprehensive e-book collections. As a result, only a small fraction of the books needed by library users are available in digital format (Wallin, 2019). Studies indicate that e-book collections differ significantly in availability, format, and accessibility, leading to inconsistencies in adoption patterns. Furthermore, students' perceptions of e-books as useful academic tools vary depending on their prior exposure to digital resources and institutional support structures (Lalwani et al., 2020). Also, findings indicate that e-book reading continues to rise. The percentage of readers engaging with e-non-fiction books grew from 13% in 2017 to 16% in 2018, while e-fiction readership increased from 16% to 18% during the same period (Wallin et al., 2019).

Research suggests that differences in e-book usage across institutions stem not only from technical infrastructure disparities but also from educational strategies and policies that influence digital learning adoption (Smith & Wideberg, 2017). Libraries that actively promote digital literacy training programs see higher rates of e-book engagement compared to institutions that rely solely on student self-navigation of digital resources.

Additionally, the role of user experience in e-book adoption is an essential factor. Features such as searchability, text-to-speech functions, offline accessibility, and annotation tools significantly influence students' willingness to engage with e-books (Bergström et al., 2017). Some students appreciate these functionalities as they enhance accessibility and ease of use, while others find the lack of a tangible reading experience as a deterrent (Tosun, 2014). Moreover, technological advancements such as interactive textbooks, AI-driven personalised learning experiences, and virtual libraries have further shaped how students engage with digital reading materials (Wang & Bai, 2016).

Despite these advantages, barriers to e-book adoption persist. Research highlights that screen fatigue, distractions from digital devices, and poor navigation interfaces deter students from fully integrating e-books into their learning routines (DeNoyelles et al., 2015). Additionally, some students report a lack of awareness of library-provided e-books, leading to underutilisation of available resources (Abdullah & Gibb, 2008). Addressing these concerns through effective library policies and enhanced user training can significantly improve student engagement with e-books.

Hypothesis 1: Students with greater exposure to digital learning tools will exhibit higher satisfaction and more frequent e-book usage.

2.2 Theoretical context and adoption of e-books

The Technology Acceptance Model (TAM) and its extension, TAM2, have been widely applied in studies of technology adoption, including e-books (Venkatesh & Davis, 2000). TAM2 emphasises perceived usefulness and perceived ease of use as key determinants of technology adoption. The model suggests that individuals are more likely to adopt a new technology if they perceive it as beneficial and easy to use. Tattersall Wallin's (2016) study revealed that Swedish young adults generally hold a positive attitude toward e-books, valuing their flexibility and accessibility. Additionally, younger individuals (aged 16–29) are the most frequent readers of digital books, while digital reading declines with increasing age (Wallin et al., 2020).

In the context of e-books, perceived usefulness relates to how students view e-books in terms of improving their learning efficiency, providing quick access to materials, and facilitating research (Lalwani et al., 2020). Perceived ease of use, on the other hand, is influenced by factors such as the interface design of e-book platforms, the availability of training resources, and students' prior experience with digital reading technologies (Joo & Choi, 2015). Research suggests that a positive digital reading experience leads to greater adoption rates, whereas usability issues can deter students from engaging with e-books (Scullin, 2015).

As digital learning environments continue to evolve, it is essential to reassess whether previously established patterns - such as laptop dominance and PDF format preference - still hold true. With the increasing availability of e-books and the growing use of tablets and smartphones, these trends may be shifting. Additionally, institutional factors such as digital infrastructure and student support may further influence e-book adoption, revealing new insights into usage frequency variations. This study aims to contribute to an updated understanding of these patterns and their potential transformation.

An extension of TAM2, the Unified Theory of Acceptance and Use of Technology (UTAUT), further expands on these concepts by incorporating factors such as social influence, facilitating conditions, and behavioural intention (Venkatesh & Bala, 2008). Social influence, including faculty recommendations, peer usage trends, and institutional promotion of e-books,

has been found to play a critical role in e-book adoption in academic environments (Wang & Bai, 2016).

Additionally, institutional support mechanisms such as dedicated e-book help desks, structured e-resource workshops, and university-wide digital literacy initiatives significantly impact adoption trends (Maceviciute et al., 2017). Students who receive hands-on training and personalised assistance are more likely to develop positive perceptions of e-books, which aligns with the TAM2 framework's emphasis on external influences.

Another crucial factor is self-efficacy in using digital tools. Students who feel confident in their ability to search, retrieve, and utilise e-books effectively are more likely to integrate them into their academic workflow. However, those who lack these skills may avoid using e-books altogether, reinforcing digital inequality (Joo & Choi, 2015). Research has also pointed out the importance of habit formation - students who frequently engage with e-books in their early academic years are more likely to continue using them as they progress in their studies (Wilson et al., 2020).

Furthermore, psychological factors such as trust in digital resources, security concerns, and resistance to technological change impact students' acceptance of e-books (Huang & Chang, 2019). Concerns over data privacy, accessibility constraints due to DRM restrictions, and reliability of e-book platforms can deter students from using digital learning materials, despite their apparent advantages (Shelburne, 2009).

Hypothesis 2: E-book usage frequency will vary based on institutional characteristics, including library resources and digital literacy support.

By incorporating TAM2 and related technology acceptance models, this study aims to provide a comprehensive understanding of the factors influencing e-book adoption in Swedish universities. Through analysing how students perceive e-books and the role of institutional support, this research will contribute to identifying strategies for improving digital learning experiences in higher education.

Although TAM2 has been successfully used in research on e-learning and digital resource adoption, its application in university library e-book studies remains limited. This study fills that gap by applying TAM2 to assess variations in e-book usage and students' perceptions. Previous research suggests that factors like age, academic discipline, and digital infrastructure influence e-book adoption (Scullin, 2015; Huang & Chang, 2019). However, empirical gaps remain in understanding how institutional differences between Swedish universities impact these factors.

2.3 Historical development of e-books and academic libraries

The history of e-books dates back to 1931 when the American Foundation for the Blind introduced the first talking books (Jbeen et al., 2022). The launch of Project Gutenberg

in 1971 by Michael Hart marked a turning point, making digital books widely available. The 1990s saw the rise of commercial e-book services, and by 2007, Amazon's Kindle revolutionised digital reading (Bergström et al., 2017).

Despite these technological advancements, academic libraries have faced significant challenges in fully integrating e-books into their collections, primarily due to licensing restrictions, lack of awareness, and format limitations (Wu & Chen, 2011). Swedish universities have gradually increased digital library resources, but challenges remain in ensuring equitable access, usability, and user engagement with these resources. While e-books have allowed for improved accessibility, their integration into academic settings requires continuous adaptation to evolving publishing models, user needs, and technological advancements (Maceviciute & Borg, 2013).

A crucial factor in the historical development of e-books has been library acquisition policies. As publishers transitioned from print to digital formats, licensing agreements and restrictions on digital borrowing emerged as challenges for libraries (Shelburne, 2009). Subscription-based access models, digital rights management (DRM) controls, and limits on concurrent users have shaped how students interact with digital resources. Unlike physical books, where ownership signifies permanent possession, e-books often operate on licensing agreements. The phrase 'the library does not own all of these titles' reflects this shift - libraries frequently purchase access rather than outright ownership. This nuance raises questions about the longevity of e-book access, restrictions on usage, and the implications for collection development policies. Understanding this distinction is pivotal for analysing the availability and accessibility of e-books to students. This study explores how these historical changes impact students' current e-book usage patterns and whether institutions have successfully adapted to emerging technological and policy-driven shifts.

2.4 Understanding and awareness of e-books in academic libraries

Awareness of e-books remains a critical factor in their adoption. Libraries have transformed from physical book repositories to digital information hubs, significantly impacting students' information-seeking behaviours (Wells & Sallenbach, 2015). A 2022 survey found that 85% of academic libraries now integrate e-books into their collections (Barnett, 2022). Despite the widespread availability of digital collections, research shows that many students remain unaware of the full extent of e-books offered by their institutions (Abdullah & Gibb, 2008). A study conducted by Corlett-Rivera and Hackman (2014) found that a large proportion of students fail to utilise available e-book resources due to a lack of promotional efforts, user training, and platform usability issues. Libraries have adopted strategies such as information literacy programs, faculty recommendations, and promotional campaigns to improve student engagement with e-books (Wang & Bai, 2016). However, institutional efforts alone may not be sufficient without curriculum integration and direct incentives for students to engage with digital resources.

A crucial challenge in e-book awareness is the perception that digital materials may lack the same academic credibility as printed books. Studies indicate that students often view printed books as more authoritative and reliable, particularly due to concerns about formatting inconsistencies, lack of proper citations, and platform limitations (Abdullah & Gibb, 2008; Corlett-Rivera & Hackman, 2014). This perception can lead to hesitation in adopting e-books for academic use, despite their convenience and accessibility. Furthermore, limited exposure to e-book functionalities, such as advanced search options, annotation tools, and accessibility features, can deter students from utilising them effectively.

Libraries must therefore take a proactive approach in enhancing awareness through workshops, one-on-one consultations, and direct integration into coursework, ensuring that students gain hands-on experience with e-books. Additionally, collaborations between librarians and faculty members can help bridge this gap by incorporating e-book usage into syllabi and research activities (Corlett-Rivera & Hackman, 2014).

2.5 Utilisation patterns of e-books

The adoption of e-books varies across academic disciplines. Studies indicate that students in STEM fields and business disciplines exhibit higher engagement with e-books than those in literature and humanities (Wilson et al., 2020). This is attributed to curricular differences, digital infrastructure, and the availability of digital textbooks (Pierard et al., 2020).

A key consideration in e-book utilisation is device preference. Reading an e-book involves a combination of various technologies, including reading devices, file formats, service providers, and different apps or platforms. While e-books can be accessed on laptops and desktop computers, dedicated devices such as smartphones, tablets, and e-readers provide greater portability. In Sweden, tablets and laptops are the most commonly used devices for e-book reading (Wallin, 2019). Another research indicates that laptops remain the most commonly used device for reading e-books, followed by tablets and smartphones, with dedicated e-readers being the least favoured (Miller et al., 2019). Another important factor is file format preference - PDFs remain the most widely used due to their compatibility and ease of navigation (Islam, 2018).

Furthermore, e-book readership has remained stable among men and the overall group of respondents. However, an exception is noted among women, where the proportion of e-book readers has risen by one percentage point (Tattersall Wallin & Gunnarsson Lorentzen, 2024). Fry (2020) found that e-book adoption takes time, with usage rates increasing gradually after their introduction into university curricula. Tracy (2020) observed that students prefer features such as search functions, note-taking, and text-highlighting capabilities. However, barriers such as platform usability issues, DRM restrictions, and access limitations continue to hinder engagement (Rafiq & Warraich, 2019).

One significant factor influencing e-book utilisation is reading behaviour. Research suggests that students engage differently with e-books compared to printed books, often skimming rather

than deeply reading the material (Islam, 2018). The ability to quickly search within digital texts is advantageous, yet some students struggle with retaining and comprehending information from screen-based reading. These challenges emphasise the need for user-friendly interfaces and training sessions that focus on digital reading strategies.

Hypothesis 3: Laptops will be the most used device for reading e-books in university libraries.

Hypothesis 4: PDFs will be the preferred file format among students due to accessibility and functionality.

2.6 Students' perceptions of e-books

Students' perceptions of e-books are influenced by factors such as convenience, accessibility, usability, and academic necessity (Tosun, 2014). The key factors driving e-book demand include the readers' need for a portable and convenient format, easy online access to collections, availability of reading devices, and the technology's ability to adjust text size and other reading preferences (Wallin, 2019). Research suggests that students who frequently engage with digital learning tools perceive e-books as effective academic resources, yet preferences for print materials persist (DeNoyelles et al., 2015). Further studies indicate that perceptions vary by academic discipline. Medical and engineering students, for instance, exhibit higher e-book engagement due to the widespread availability of digital textbooks in their fields (Wu & Chen, 2011). Moreover, concerns regarding eye strain, screen fatigue, and limited tactile engagement contribute to negative perceptions of e-books, particularly among students who prefer traditional reading methods (Wu & Chen, 2011). Some students feel that e-books lack the sensory experience of printed books, such as the ability to highlight, write notes in margins, and physically interact with pages, making them less desirable for intensive study sessions.

To improve e-book perceptions, institutions should focus on enhancing user experience, providing better accessibility tools, and increasing awareness of available resources (Hjertzell, 2022). Incorporating e-books into collaborative learning environments and offering interactive features such as discussion forums and shared annotations can also help mitigate some of the disadvantages associated with digital reading.

Hypothesis 5: Undergraduate and graduate students will demonstrate different e-book usage patterns, with graduate students showing higher engagement.

The literature highlights that e-books enhance accessibility and flexibility but are influenced by institutional policies, digital literacy, and student preferences. While laptops and PDFs remain dominant, emerging technologies may be reshaping usage patterns. Variations in e-book adoption across universities suggest the role of digital infrastructure and support services, yet limited studies focus on these shifts in Swedish higher education. This study addresses this gap by examining whether established e-book usage trends persist and how institutional factors influence engagement.

3. Theoretical framework

This study is grounded in the Technology Acceptance Model 2 (TAM2), which builds on the original TAM by incorporating additional external variables that help explain technology usage. In choosing TAM2 over alternatives such as TAM3 or the Unified Theory of Acceptance and Use of Technology (UTAUT), this study focuses on the central constructs of perceived usefulness (PU) and perceived ease of use (PEOU) and their influence on behavioural intention, while also capturing the moderating effects of external variables such as digital literacy support and library resource availability. This focus is justified because TAM2 has been widely applied in studies on digital resource adoption in academic settings (Venkatesh & Davis, 2000), and its constructs are directly relevant to explaining the observed variations in e-book usage among students.

3.1 Overview of the TAM model

The Technology Acceptance Model (TAM) identifies two fundamental cognitive beliefs: perceived usefulness and perceived ease of use. It proposes that a user's actual adoption of information technology is influenced by behavioural intention, perceptions of the system's usefulness, attitude, and ease of use. As a widely applied framework, TAM helps explain users' acceptance of e-learning and predicts their adoption of information technology (Abdul Ghani et al., 2019). Perceived usefulness reflects an individual's belief in a system's ability to enhance task performance, while perceived ease of use refers to the level of effort required to operate the system without significant physical or mental strain (Davis, 1989). Additionally, TAM asserts that attitude, perceived usefulness, and ease of use collectively shape an individual's intention to adopt technology, which in turn determines actual usage. A key aspect of TAM is the role of behavioural intention, suggesting that attitude influences intention, which ultimately drives technology adoption (Venkatesh et al., 2012). The following figure illustrates the key constructs within the TAM model.

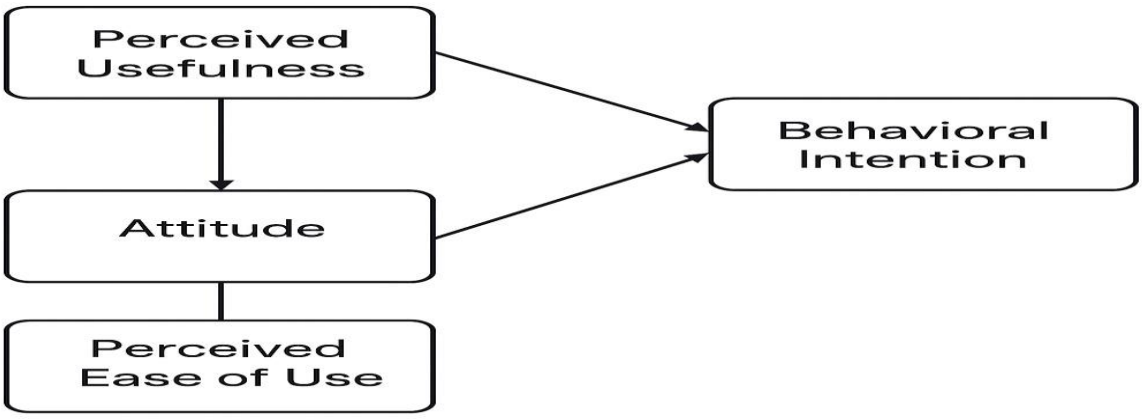

Figure 1. Technology Acceptance Model 1, TAM1

Adapted from Abdul Ghani et al. (2019).

The Technology Acceptance Model (TAM) has evolved over time, leading to the development of Technology Acceptance Model 2 (TAM2) by Venkatesh and Davis (2000). Unlike the original TAM, TAM2 omits the 'attitude' component, even though it is recognised as a mediator between perceived usefulness and perceived ease of use. Additionally, TAM2 extends the original model by incorporating new theoretical constructs, including experience, social influence factors (subjective norm, voluntariness, and image), and cognitive instrumental processes (job relevance, output quality, and result demonstrability). The following diagram illustrates the key constructs within the TAM model.

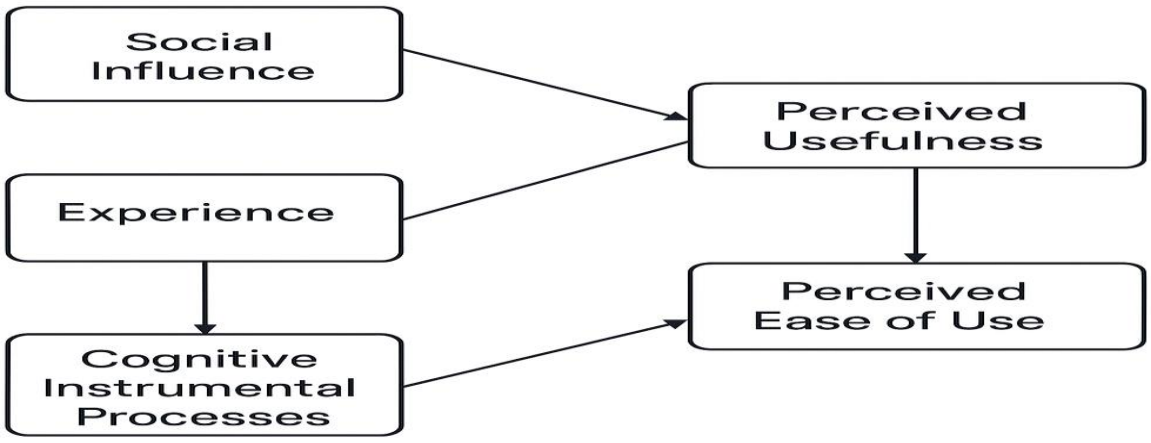

Figure 2. Technology Acceptance Model 2, TAM2

Adapted from Abdul Ghani et al. (2019).

Another variation of the Technology Acceptance Model is TAM3, which integrates TAM2 with factors influencing perceived ease of use (Venkatesh & Bala, 2008). TAM3 highlights four key constructs - individual differences, system characteristics, social influence, and facilitating conditions that shape perceived usefulness and perceived ease of use. According to this model, user experience moderates the relationships between perceived ease of use and perceived usefulness, computer anxiety and perceived ease of use, as well as perceived ease of use and behavioural intention. The following diagram illustrates the key constructs within the TAM3 model.

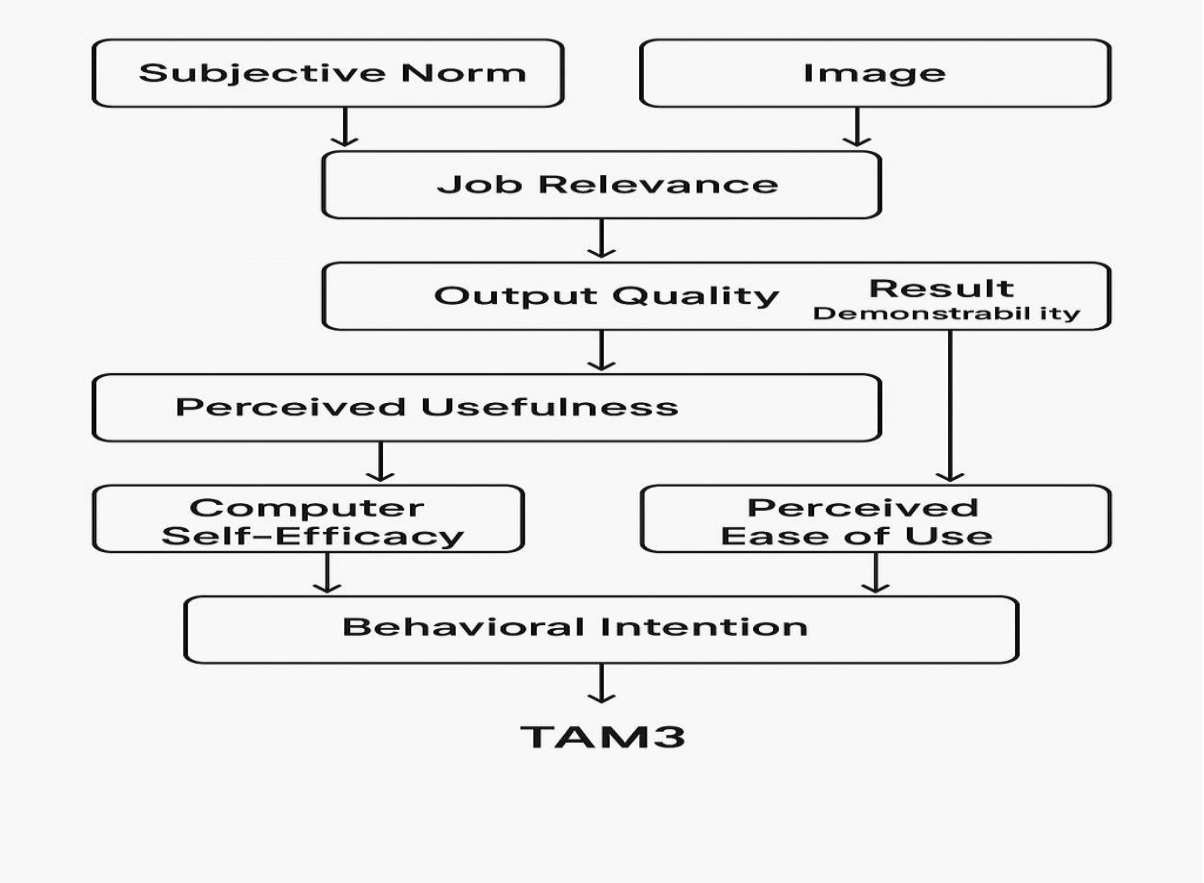

Figure 3. *Technology Acceptance Model 3 (TAM3), illustrating relationships among system characteristics, social influence, and perceived ease of use.*
Adapted from Abdul Ghani et al. (2019).

3.2 Justification for the use of TAM2

While several models exist to study technology adoption, TAM2 is particularly suited to this research due to its emphasis on external variables such as social influence and facilitating conditions-factors critical in academic library settings. Alternative models like TAM3 (Venkatesh & Bala, 2008) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2012) offer additional constructs, but TAM2 is preferred for its focus on cognitive instrumental processes, which align closely with the factors influencing e-book adoption in university libraries.

- TAM3, though comprehensive, emphasises individual differences (e.g., computer self-efficacy), which are beyond the scope of this study.
- UTAUT incorporates performance expectancy and effort expectancy but is designed for workplace environments rather than academic settings.
- TAM2, in contrast, specifically examines external influences such as library infrastructure, digital literacy support, and institutional policies, making it the most relevant framework for analysing students' e-book usage.

3.3 Core constructs of TAM2 and their relevance to this study

TAM2 extends TAM by incorporating social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, and result demonstrability). This study integrates these elements to understand how students perceive and engage with e-books.

- Perceived Usefulness (PU): The extent to which students believe that e-books enhance their learning.
- Perceived Ease of Use (PEOU): The degree to which students find e-books easy to use.
- Social Influence (SI): The role of peers, faculty, and institutional norms in shaping e-book usage.
- Facilitating Conditions (FC): Institutional support mechanisms, including digital literacy training and e-book availability.

3.4 Mapping research questions and hypotheses to TAM2

This study's research questions align with TAM2 constructs as follows: The research questions are closely related to TAM2 components.

RQ1: What are the specific patterns of e-book usage among students at different universities.

The first research question explores the specific patterns of e-book usage among students at different universities. This relates to perceived ease of use (PEOU) and facilitating conditions (FC) because students' ability to access and use e-books depends on how user-friendly the digital platforms are and the level of institutional support available to them. Differences in university policies, digital literacy training, and library resources contribute to variations in e-book usage patterns.

RQ2: What factors contribute to variations in e-book adoption?

The second research question investigates the factors that contribute to variations in e-book adoption. This question aligns with perceived usefulness (PU), social influence (SI), and facilitating conditions (FC). Students may be influenced by their perceptions of how beneficial e-books are to their academic success, the opinions and behaviours of their peers and faculty members, and the institutional resources supporting e-book access and usage.

RQ3: How do students perceive the accessibility and effectiveness of e-books?

The third research question examines how students perceive the accessibility and effectiveness of e-books. This is directly linked to perceived usefulness (PU) and perceived ease of use

(PEOU) because students' attitudes toward e-books depend on how accessible and functional they find them for academic learning. If students view e-books as difficult to use or lacking necessary features, their adoption rates may be lower.

The hypotheses are structured based on TAM2's predictive capacity:

H1: Students with greater exposure to digital learning tools will exhibit higher satisfaction and more frequent e-book usage. (SI, PBC: Social influence from peers and faculty, along with greater perceived behavioural control, will increase satisfaction and frequency of e-book usage.)

H2: E-book usage frequency will vary based on institutional characteristics, including library resources and digital literacy support. (FC, PU: Institutional factors such as library resources and digital literacy programs influence perceived usefulness and adoption rates.)

H3: Laptops will be the most used device for reading e-books in university libraries. (PEOU, FC: Laptops are perceived as easy to use, and their availability in academic settings supports frequent usage.)

H4: PDFs will be the preferred file format among students due to accessibility and functionality. (PU, PEOU: PDFs are seen as useful and easy to navigate, making them a preferred choice for students.)

H5: Undergraduate and graduate students will demonstrate different e-book usage patterns, with graduate students showing higher engagement. (PU, Cognitive Instrumental Processes: Graduate students perceive e-books as more useful for research, leading to higher engagement.)

3.5 Implementation of TAM2 in data collection and analysis

To operationalise TAM2, this study:

- Designed a structured questionnaire where each question corresponds to a TAM2 construct.
- Classified variables correctly, ensuring that categorical data (e.g., academic discipline) was analysed using chi-square tests to test the null hypotheses.
- Used regression analysis to examine relationships between key variables, as it allows for better interpretation of how independent variables such as digital literacy training, device preference, and institutional support influence dependent variables like e-book usage frequency and satisfaction.

- Accounted for external variables, explicitly incorporating institutional factors (library resources, training) into the statistical model.
- Justified each statistical test, aligning methods (e.g., chi-square for categorical data and regression analysis for variable relationships) with TAM2's theoretical predictions.

3.6 Conceptual model

The conceptual model of this study illustrates the key factors shaping students' adoption of e-books, based on the Technology Acceptance Model 2 (TAM2). Institutional support mechanisms, such as digital literacy training and the availability of e-books, function as **facilitating conditions** that influence students' **Perceived Ease of Use (PEOU)** and **Perceived Usefulness (PU).** In addition, **social influence factors,** including faculty encouragement and peer recommendations, further contribute to the formation of positive perceptions toward e-books.

These perceptions, captured through PEOU and PU, directly shape students' **behavioural intention to use e-books,** which in turn determines their **actual e-book usage patterns.** By integrating both institutional and social dimensions with TAM2's core constructs, the model provides a structured framework for analysing how contextual, perceptual, and behavioural factors collectively explain variations in e-book adoption among university students.

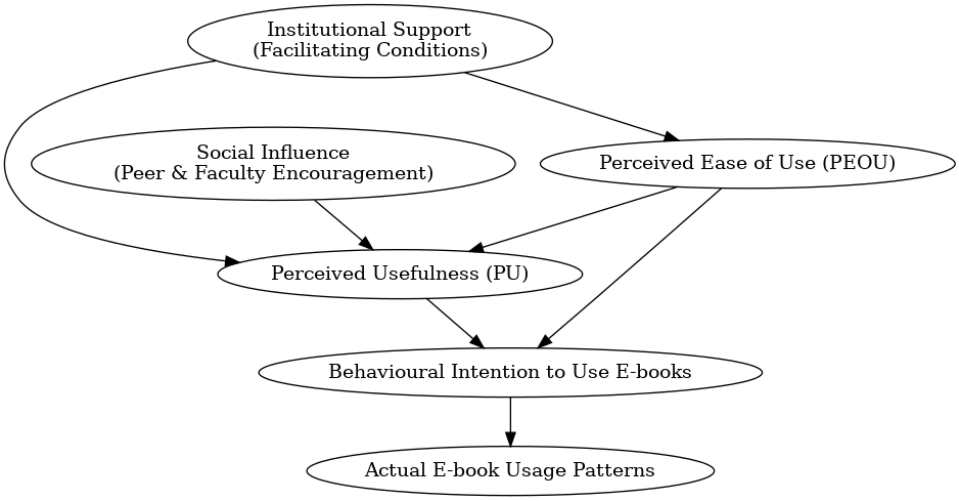

Figure 4. *Conceptual model of e-book adoption based on the Technology Acceptance Model 2 (TAM2).*

4. Methodology

This chapter outlines the methodological choices made in the study, including the research approach, sampling, study design, questionnaire development, data collection, data analysis, reliability and validity considerations, ethical procedures, and limitations. The study employed a self-selection sampling approach, meaning that students independently chose to participate after being informed about the survey. This design was suitable for an online questionnaire format and ensured voluntary participation across both universities.

4.1 Study approach

This study adopted a mixed-methods approach, integrating both quantitative and qualitative procedures. The quantitative component, based on an online survey, provided structured, measurable data about students' e-book usage patterns and perceptions. This provided the possibility to produce descriptive statistics, detect trends, and test hypotheses concerning preferred formats, devices, and usage frequency. The qualitative component, consisting of open-ended survey questions, enriched the findings by capturing students' personal reflections, challenges, and suggestions regarding e-books.

The choice of a mixed-methods approach was motivated by the recognition that e-book usage among university students is a multifaceted phenomenon. Quantitative data alone could identify general patterns, but it could not fully capture the nuanced perceptions, frustrations, and contextual factors that shape students' engagement with e-books. Conversely, qualitative data alone could provide depth but would not allow for the testing of hypotheses or identification of broader trends. By combining both approaches, the study aimed to balance breadth and depth: quantitative findings established the scale and frequency of particular behaviours, while qualitative findings illuminated the meanings and interpretations behind those behaviours.

This combination is particularly relevant in the field of Library and information science, where both measurable usage patterns and subjective user experiences are central to evaluating digital resources. The mixed-methods design therefore ensured that the study not only identified *how* students use e-books but also provided insight into *why* they use them in particular ways and *what challenges* they encounter. In addition, the combination of quantitative and qualitative strands supported the application of the TAM2 theoretical framework: survey data provided measurable indicators of constructs such as perceived usefulness, ease of use, and usage frequency, while qualitative responses added contextual explanations and examples that helped interpret these constructs in practice.

By using a survey-based design, the study ensures a systematic investigation of how students at different universities interact with e-books, without making direct comparisons between institutions. The selection of an online survey format ensures broad accessibility and convenience for respondents, allowing students from both universities to participate

irrespective of their geographical location. This format also facilitates efficient data collection and analysis, ensuring reliability and consistency in responses.

4.2 Sampling

The study follows a two-stage non-probability sampling approach:

Population and sampling frame:

The total student population at the two universities at the time of the study was approximately 21,000 students at the University of Borås (HB) and 18,700 students at Luleå University of Technology (LTU). This combined population of about 39,700 students served as the overall sampling frame. The sampling frame was constructed differently for each university due to practical constraints. At HB, the survey was distributed through the SUNET platform, which is used for official communication with enrolled students. At LTU, the survey was distributed via the public Facebook group *'Nya studenter LTU'*, which served as an accessible but informal channel to reach current students.

Sample size and response rate:

A total of 86 valid responses were collected, of which 53 came from HB and 33 from LTU. This corresponds to a response rate of 0.25% at HB and 0.18% at LTU, with an overall response rate of approximately 0.22% of the combined student population. Such low response rates limit the generalisability of the findings. However, the inclusion of open-ended survey questions provided a qualitative component, which partly compensates for the limited statistical representativeness by offering richer insights into student perspectives.

Sampling method:

1. **University selection:** The University of Borås and Luleå University of Technology were chosen using purposive sampling. This means the selection was based on specific criteria rather than random selection. Both universities were considered suitable because they provide extensive e-book collections, prioritise digital learning, and represent distinct academic environments. This means, the key reasons for choosing these two universities were:

- Institutional characteristics: Both universities have distinct academic profiles and technological infrastructures, which may influence e-book adoption.

- Digital learning emphasis: These institutions prioritise digital education, making them suitable for studying e-book usage.

- Availability of e-book resources: Both libraries provide extensive e-book collections, making them relevant for this research.

Since the study aimed to analyse how institutional factors affect e-book usage, selecting these two universities allowed for an exploration of different digital learning environments.

2. **Student selection:** After selecting the universities, self-selection sampling was used to recruit student participants. This means that students voluntarily chose to participate in the survey after being informed about it, rather than being directly selected by the researcher. Given the online distribution format and the voluntary nature of participation, self-selection sampling was the most practical and ethical choice for this study. It allowed students to participate freely without institutional pressure or direct recruitment. This method is commonly used in online research, as it enables broad participation and is simple, cost-effective, and time efficient. However, a notable drawback of self-selection sampling is the potential for sampling bias, as participation depends on individuals' motivation and awareness of the survey, which may limit generalisability (Bornstein et al., 2017). While this method involves voluntary participation and therefore limits generalisability, efforts were made to increase diversity by including undergraduate and graduate students from multiple disciplines. To reduce participation bias, the survey invitation was distributed broadly through official mailing lists (Borås) and student community groups (Luleå) to reach as many potential participants as possible. Participation was encouraged with multiple reminders to improve representation.

   Although overall response rate was low (approximately 0.22% of the combined student population), the final dataset included 86 valid responses, which, while not representative of the entire student population, provided sufficient material for an exploratory analysis. Consequently, the findings are interpreted as indicative trends rather than definitive generalisations. To avoid distortions caused by unequal institutional response rates, results are analysed in aggregated form rather than as direct comparisons between the two universities.

- University of Borås students: Survey distribution was done via the Swedish University Network (SUNET) platform, targeting students who had engaged with library e-books.

- Luleå University of Technology students: Data collection was conducted by sharing the survey link in the Facebook group 'Nya studenter LTU', allowing easy access to potential participants.

- Diverse participation: The sample included undergraduate and graduate students from various disciplines to provide a broad understanding of e-book usage.

4.3 Study design

The design draws on the Technology Acceptance Model 2 (TAM2), which explains adoption through perceived usefulness (PU), perceived ease of use (PEOU), social influence, and facilitating conditions. Survey items were mapped to these constructs.

Usage patterns were defined broadly as:

- frequency of use,
- session duration,
- device type,
- file format preferences,
- language preferences, and
- respondents' length of experience with e-books.

The qualitative data allowed further exploration of perceptions, barriers, and suggestions, complementing quantitative measures.

TAM2 is an extension of the original Technology Acceptance Model (TAM), incorporating additional variables such as social influence and cognitive instrumental processes, which help explain how and why students adopt digital technologies like e-books (Venkatesh & Davis, 2000). The study design revolves around understanding how students interact with e-books in academic settings and identifying key determinants influencing their engagement. TAM2 provides a structured framework to analyse the adoption of e-books by measuring various constructs, such as perceived usefulness, perceived ease of use, and external factors like institutional provisions and digital literacy support.

Rationale for using TAM2

TAM2 is particularly relevant for this study because:

- It captures both individual and institutional factors that shape technology adoption.
- It provides a well-established, validated structure for examining how perceptions of usefulness and ease of use influence behavioural intention.
- It allows for the inclusion of external variables, such as social norms and institutional policies, which are critical in understanding students' e-book usage.

TAM2 constructs in this study

The study incorporates the following TAM2 constructs:

- Perceived usefulness (PU): Measures how students perceive the effectiveness of e-books in supporting their academic work, including accessibility, convenience, and time efficiency.

- Perceived ease of use (PEOU): Assesses how intuitive and user-friendly students find e-books, including ease of navigation, compatibility with devices, and the availability of search functions.

- Social influence: Examines the role of faculty recommendations, peer perceptions, and institutional encouragement in shaping students' willingness to adopt e-books.

- External factors: Includes the provision of e-books in university libraries, digital literacy support, and overall accessibility policies.

Integration of TAM2 into the study design

TAM2 was applied at multiple stages of the study, informing both the quantitative and qualitative components:

1. Survey design:
    - The structured questionnaire included items corresponding to key TAM2 constructs (e.g., perceived usefulness, perceived ease of use, social influence, and facilitating conditions) to generate quantifiable data.
    - Open-ended questions were also designed to capture students' experiences, perceptions, and suggestions, allowing respondents to articulate factors influencing their e-book use in their own words.
2. Data analysis:
    - Quantitative analysis used descriptive and inferential statistics to examine relationships between TAM2 constructs, such as whether social influence affected perceived usefulness or ease of use.
    - Qualitative thematic coding complemented this by identifying how students described these constructs in practice - for example, narratives about ease of navigation, peer influence, or institutional support.
3. Interpretation of findings:
    - The integration of quantitative and qualitative results allowed TAM2 to be applied more comprehensively. Survey statistics established measurable patterns, while qualitative insights explained *why* students perceived e-books as

useful or challenging, and how institutional or social factors shaped these perceptions.

- This dual perspective strengthened the explanatory power of TAM2 in understanding e-book adoption, showing not only the statistical relationships but also the lived experiences behind them.

Study design justification

The study design was chosen to align with the research aims of examining students' e-book usage patterns, perceptions, and influencing factors across two Swedish universities. A mixed-methods design was deemed appropriate for the following reasons:

1. Alignment with research questions: The research questions address both *what* patterns of e-book use exist (quantitative) and *how* students perceive and experience these practices (qualitative). A single method would not have been sufficient; combining both allowed the study to capture measurable trends while also exploring students' subjective experiences.
2. Complementarity of data: Quantitative data provided structured evidence about frequency of use, devices, and attitudes, while qualitative responses highlighted nuances such as frustrations with digital interfaces, accessibility benefits, or the role of social and institutional factors. Taken together, these strands offer a more complete picture of e-book adoption and use.
3. Theoretical fit with TAM2: The TAM2 framework incorporates both measurable constructs (e.g., perceived usefulness, ease of use, social influence) and contextual factors that shape adoption. A mixed-methods design enabled the operationalisation of TAM2 through survey items, while open-ended responses gave insight into how students experience and articulate these constructs in their own contexts.

By adopting this design, the study balanced breadth and depth, ensuring that statistical findings were enriched with qualitative insights. This justified approach makes it possible to both test hypotheses related to e-book usage patterns and interpret students' lived experiences in light of the theoretical framework.

4.4 Questionnaire structure and design

Questionnaire surveys are extensively used in the field of information and library science to collect diverse data on respondents' beliefs, opinions, attributes, and behaviors (Hank et al., 2017). This method is particularly effective for exploring various research scenarios, including assessing project quality, evaluating employee satisfaction, and understanding information behaviors (Lin, 2019). Furthermore, surveys serve as valuable research tools for gathering large volumes of data (Bryman, 2016) and enabling comparisons of reading habits across different respondent groups. Hank et al. (2017) emphasise the importance of designing questionnaires

using complete sentences and recommend limiting questions to those essential for the study. They also suggest employing neutral language to prevent misunderstandings, biases, or offense. Additionally, Bryman (2016) highlights the significance of collecting demographic information in social research, stressing the need to understand variables such as gender, age, and departmental affiliation. According to Hank et al. (2017), to reduce respondent anxiety, personal information should be requested at the end of the questionnaire, which guided the placement of this section in the present study. Despite its advantages, the questionnaire survey method has certain limitations. One key drawback, as noted by Bryman (2016), is that respondents must complete the questionnaire independently, without the opportunity to seek clarification if they encounter unclear questions. This lack of direct support may affect response accuracy and completeness.

The questionnaire (Appendix 1) was designed to systematically capture students' e-book usage behaviours, perceptions, and influencing factors, ensuring a structured approach to data collection. The survey consisted of 25 questions categorised into four main sections, aligning with the Technology Acceptance Model 2 (TAM2) framework and research questions.

Structure of the questionnaire

The questionnaire comprised the following key sections:

1. E-book usage patterns: Measuring frequency, session duration, preferred devices, formats, and language preferences.

2. Perceptions and attitudes toward e-books: Assessing satisfaction, usefulness, quality, convenience, accessibility, and library provisions.

3. Factors influencing e-book adoption: Evaluating reasons for initial adoption, institutional support, digital literacy training, peer/faculty influence, and barriers to use.

4. Demographics: Capturing participants' academic level, discipline, university affiliation, gender, and age.

Each question was carefully structured to provide quantitative insights into e-book usage trends while ensuring alignment with the research questions and theoretical framework. Also, the questionnaire included open-ended questions to capture qualitative insights (e.g., 'Which database in your university library do you use to get access to e-books?', 'Any comments or suggestions you may have regarding your experience with e-book in the university library?').

A pilot test with three students was conducted to check clarity and content validity. This improved readability and flow but cannot confirm reliability. Reliability in a strict statistical sense was not tested (e.g., Cronbach's alpha), which is a limitation of the study. However, practical reliability was supported through a structured questionnaire design, consistent

administration across all respondents, and the use of closed-ended questions with standardised response options.

Clarification of variable definitions

To ensure accuracy and consistency in data analysis, the study classifies variables as follows:

- Categorical variables: Distinct groups such as gender, academic level, and preferred e-book format.
- Ordinal variables: Ordered categories such as frequency of e-book use (e.g., daily, weekly, monthly).
- Continuous variables: Measured numerically, such as session duration in minutes.
- Dependent variables: E-book usage patterns and student perceptions.
- Independent variables: Factors such as institutional support, social influence, and prior experience with digital learning tools.

Justification for question types and measurement scales

To ensure the accuracy and relevance of collected data, the questionnaire included a mix of multiple-choice, Likert scale, and open-ended questions:

- Multiple-choice questions were used to capture structured responses for usage patterns and device preferences.
- Likert scale questions (ranging from *strongly agree* to *strongly disagree*) measured perceptions of e-book usefulness, accessibility, and institutional support.
- Open-ended questions were incorporated to allow respondents to provide additional insights into their preferences, challenges, and recommendations for improving e-book services.

Mapping to TAM2 constructs

The questionnaire was directly linked to TAM2 constructs to facilitate structured analysis:

- Perceived usefulness (PU): Questions on academic effectiveness, accessibility, and efficiency.

- Perceived ease of use (PEOU): Items assessing navigation ease, compatibility, and device flexibility.

- Social influence: Questions regarding peer and faculty recommendations.

- External factors: Availability of e-books, institutional digital literacy support, and access barriers.

Mapping of survey questions to the corresponding research questions and TAM2 constructs is provided below (Table 1). A detailed mapping of each survey question to the corresponding research questions and TAM2 constructs is provided in Appendix 2.

Research question	**Relevant survey questions**	**TAM2 construct**
What are the specific patterns of e-book usage?	Frequency of use, Session duration, Device types, Preferred formats, Languages used	PU, PEOU
What are students' perceptions of e-books?	Satisfaction with e-books, Helpfulness, Quality comparison with print, Convenience of e-books vs. print books	PU
What factors contribute to variations in e-book usage?	Ease of access, Library e-book provisions, Institutional digital literacy support, First-time use reasons, Training received, Experience with digital tools, Influence of professors and peers, Sources for discovering e-books	PEOU, External factors, Social influence

Table 1. *Mapping of survey questions to research questions and corresponding TAM2 constructs.*

Questionnaire implementation and validation

As mentioned before, the questionnaire was pilot tested with three students before full distribution to ensure:

- Clarity and readability of questions.
- Logical flow and organisation of survey sections.
- Time efficiency, ensuring completion within 10-12 minutes.

Feedback from the pilot study was incorporated into final refinements, ensuring reliability and validity in data collection.

4.5 Data collection

The data collection process was carefully structured to ensure accessibility for participants while adhering to ethical considerations. The survey was conducted using an online questionnaire survey, utilising digital distribution channels to maximise student participation. Data collection took place in April–May 2024.

Survey administration channels

1. University of Borås: University of Borås (HB):

I first contacted the Academy of Libraries, Information, Education and IT at the University of Borås by email to request permission to distribute the survey. With their support, the Academy circulated the survey link to students through the university's SUNET-based mailing lists and internal communication channels. In this way, SUNET provided the technical infrastructure, while the actual distribution was managed by the Academy, ensuring that the invitation reached relevant students.

Specifically, the survey link was shared via the university's online learning environment and internal mailing lists directed to students. SUNET itself is the national IT infrastructure provider for higher education in Sweden, and at HB it supports these platforms. In this study, SUNET served as the backbone, while the actual distribution occurred through student forums and mailing services accessible to enrolled students.

2. Luleå University of Technology:

The survey link was shared in the student Facebook group *Nya studenter LTU* on 4 April 2024, with weekly reminders until 17 May 2024.

Both quantitative and qualitative data were collected within the same survey. Participation was voluntary, anonymous, and open to all students at both universities.

To collect data from students at Luleå University of Technology (LTU), self-selection sampling method was employed. This approach involved utilising a Facebook group, 'Nya studenter LTU' commonly used by LTU students for academic and social purposes. The rationale for choosing this method was its practicality and accessibility.

The specific group used for the survey distribution is widely recognised among LTU students as a platform for exchanging information, discussing academic matters, and sharing resources. The group membership is predominantly composed of current LTU students, which ensured that the target population was reached effectively.

The questionnaire was shared as a post within the group. The post included an introduction explaining the purpose of the study, assurances of anonymity, and a link to the survey. The survey link was posted in the Facebook group 'Nya studenter LTU' on April 4, 2024. To maximise participation, reminder was sent every week in the group until May 17, 2024. Members were invited to participate voluntarily and were encouraged to share the link with other LTU students.

While self-selection sampling is not without limitations, it was deemed suitable for this study due to its ability to quickly reach a substantial number of students. Using a Facebook group provided a convenient entry point to the target population, leveraging an existing network for survey dissemination. Efforts were made to mitigate limitations of the approach by ensuring the survey link was active for a sufficient period, and participation was open to all group members without restrictions.

A total of 86 responses were collected (53 from Borås, 33 from Luleå). Given the small sample size, comparisons between universities are not statistically valid, and analysis is focused on overall patterns rather than institutional differences. The data collection process emphasised voluntary participation, anonymity, and informed consent. Additionally, response trends were analysed to identify any potential biases in demographics (e.g., gender and academic discipline distributions). However, given the constraints of self-selection sampling, results are interpreted as indicative rather than fully representative of the broader student population. Despite active promotion, engagement remained higher in Borås than in Luleå, possibly due to differences in digital communication habits or institutional support for research participation.

4.6 Data analysis

The analysis combined quantitative statistical methods and qualitative thematic coding. The collected data was analysed using a structured quantitative approach, including descriptive statistics, hypothesis testing, and regression analysis (Appendix 3). This approach enabled an in-depth examination of e-book usage patterns, student perceptions, and key influencing factors while addressing potential relationships between variables. Agresti and Finlay (2009) highlight the importance of applying statistical methods in social science research, stressing

the value of quantitative analysis in understanding usage patterns, user preferences, and the effects of e-books on library collections and services.

4.6.1 Quantitative analysis

The quantitative data were analysed using descriptive and inferential statistics.

1. **Descriptive statistics:** Descriptive statistics were used to summarise the main characteristics of the dataset, providing insights into students' e-book usage behaviours. Frequencies and percentages were calculated for categorical variables such as preferred e-book formats, device types, and e-book access methods. Additionally, graphical representations, such as bar charts and pie charts, were utilised to present trends in e-book usage patterns effectively. Such diagrams are commonly used in presenting quantitative data due to their clarity and ease of interpretation (Bryman, 2016).

2. **Chi-square tests:** The chi-square test is a statistical method used to examine relationships between categorical variables and determine whether the observed differences between groups are statistically significant. In this study, chi-square test applied solely for testing null hypotheses related to categorical variables (e.g., examining associations between academic level and e-book usage frequency). The Chi-square test of independence was specifically used to test hypotheses 2, 3, 4 and 5.

   To evaluate the null hypotheses, the chi-square test was conducted, and the p-value was calculated. The total number of observations was divided by the number of categories to obtain the expected values. The decision rule states that if the p-value exceeds 0.05 ($P > 0.05$), the null hypothesis is accepted, indicating no statistically significant relationship. Conversely, if the p-value is less than or equal to 0.05 ($P \leq 0.05$), the null hypothesis is rejected, supporting the alternative hypothesis.

3. **Regression analysis:** In this study, regression analysis was used to examine the relationships between predictor variables (independent variables, e.g., institutional support, social influence) and outcomes (dependent variables, e.g., e-book usage patterns, perceptions) related to e-book usage patterns and student perceptions. This analysis helps determine both the strength and direction of these relationships. Given the nature of the collected data, an ordinal regression model was applied, as it is appropriate when the dependent variable is ordinal (e.g., satisfaction with e-books measured on a scale from 'very satisfied' to 'very dissatisfied'). This approach allows for assessing how factors such as years of experience with e-books and device usage influence satisfaction levels.

   Furthermore, regression analysis was employed to test hypothesis 1. This method helps identify significant factors shaping student behaviour and attitudes, offering deeper insights into the variables affecting e-book adoption and usage.

Reliability was not tested through statistical measures such as Cronbach's alpha, due to dataset constraints. Instead, reliability was supported by a structured survey design, supervisor feedback on the questionnaire, and a pilot test that improved clarity and flow. These measures ensured a degree of practical reliability even though formal internal consistency testing could not be carried out. To strengthen reliability, survey items corresponding to TAM2 constructs were grouped, and qualitative data were used to supplement weaker quantitative evidence.

4.6.2 Qualitative analysis

- Open-ended responses were analysed using thematic coding. Responses from both universities were combined and examined together rather than separately, in order to identify cross-cutting themes.

- The main themes that emerged included: Awareness and use of e-book databases and platforms, perceptions of e-book quality compared to print, convenience and accessibility, differences in use across academic contexts, technical and usability challenges, and suggestions for improvement.

- For example, students highlighted advantages such as searchability, portability, and the cost-effectiveness of e-books, but also raised issues related to eye strain, poor formatting, limited access to required texts, and frustration with e-book reader software. A recurring issue was the lack of awareness of which databases they were using, with several students writing 'I do not know,' indicating a need for further user training.

- The analysis also captured constructive feedback, such as requests for more training (especially for international students), more mandatory course texts in e-book format, improved stability of e-book platforms, and clearer catalogue interfaces. Accessibility was noted as a strength, particularly through formats like Legimus, which were described as highly beneficial for students with disabilities.

- Illustrative quotes and paraphrased student voices were used to support the thematic findings and to provide authentic insights into students' experiences.

4.7 Reliability and validity

Reliability refers to the consistency and stability of a measurement tool, ensuring that it produces consistent results over time and under different conditions. Validity, on the other hand, concerns the accuracy and relevance of the measurement, confirming that it effectively measures what it is intended to assess and accurately represents the targeted concept. In research, ensuring both reliability and validity is essential for generating trustworthy and

meaningful results. In this study, these concepts were considered separately for the quantitative and qualitative components.

4.7.1 Quantitative strand

Reliability in quantitative research refers to the extent to which an instrument is free from errors and produces consistent results across repeated measures (Pallant, 2020). Reliability was not assessed through statistical techniques such as Cronbach's alpha or test–retest procedures, due to the scope and constraints of the study. Instead, practical steps were taken to enhance reliability:

- Use of structured and standardised closed-ended questions;
- Consistent survey administration across both universities;
- Clear instructions and uniform response options.

These measures helped reduce variations introduced by the research process itself. While these measures supported a reasonable degree of stability in responses, the absence of formal reliability testing means that reliability cannot be claimed with full statistical certainty.

Validity refers to the accuracy of an instrument in measuring what it intends to measure (Pallant, 2020). During the development phase, the questionnaire underwent a pilot test with three respondents from the research area. This initial testing helped evaluate the instrument's suitability and improve its quality before the final data collection process. The purpose of this pilot was to assess the clarity, wording, and relevance of the items, thereby supporting face validity and content validity. Feedback from the pilot was used to refine question wording and structure, ensuring alignment with the theoretical framework (TAM2) and the study's research questions. In addition, supervisor review of the instrument provided further assurance that the questions were consistent with the intended constructs. Finally, contextualisation of findings within existing literature served as an additional validity check.

Following Poortman and Schildkamp (2011), reliability and validity were further reinforced through systematic planning of data collection, including a clear introduction to the questionnaire to enhance response accuracy and a detailed review of data after completion to verify correctness.

4.7.2 Qualitative strand

For the qualitative data, credibility was prioritised to strengthen trustworthiness. Coding was conducted systematically and transparently, with detailed documentation of the coding procedures. Direct quotes from students were included to illustrate themes and ensure that findings remained closely tied to participants' voices. As the coding was conducted solely by the researcher, inter-coder reliability could not be established, which represents a limitation.

Nevertheless, transparency in reporting and careful alignment of codes with the research questions enhanced the credibility of the qualitative findings. While inter-coder reliability could not be tested (single-researcher coding), transparency in reporting and integration with quantitative findings improved overall validity.

4.8 Use of TAM2 in analysis

TAM2 played a crucial role in structuring the study's data analysis. The constructs of perceived usefulness (PU), perceived ease of use (PEOU), and social Influence guided the interpretation of survey results. Specifically:

- PEOU informed questions on ease of access, device compatibility, and user-friendliness.
- PU was reflected in questions assessing academic relevance and study efficiency.
- Social Influence was examined through students' perceptions of peer and faculty attitudes.

The relationship between PEOU and PU was analysed by examining whether ease of access to e-books correlates with perceived academic value. Regression analysis was used to assess how institutional support and digital infrastructure influenced e-book adoption. While TAM2 constructs structured the interpretation of results, statistical tests (e.g., chi-square, regression models) validated their impact on usage patterns.

4.9 Ethical considerations

Ensuring participant anonymity is essential for maintaining ethical standards in research (Bryman, 2016). Agresti and Finlay (2009) emphasise the importance of preserving anonymity, as assisting respondents in formulating answers may unintentionally link responses to identities. To mitigate this risk, researchers should design clear, self-explanatory questionnaires and provide only general guidance without referencing specific participants.

The study adhered to ethical research principles to ensure the rights and privacy of participants were protected. The following ethical measures were implemented:

- Informed consent: Participants were provided with a clear explanation of the study's purpose, their rights as respondents, and the voluntary nature of participation (Horts et al., 2017).

- Anonymity and confidentiality: No personally identifiable information was collected, ensuring that all responses remained anonymous (Bryman, 2016).

- Data protection and security: All data was securely stored and handled in compliance with the General Data Protection Regulation (GDPR) to maintain confidentiality. Responses were securely stored following ethical standards outlined by the Swedish Research Council (2017).

- Right to withdraw: Participants were informed that they could exit the survey at any time without providing a reason.

- Research integrity: Measures were also taken to prevent research misconduct, ensuring data integrity and confirming that all collected data would be used solely for research purposes.

By following these ethical guidelines, the study ensured that participants' privacy and autonomy were respected throughout the research process.

4.10 Limitations

While this study contributes valuable insights, several limitations must be acknowledged:

1. Sampling bias

This study employed self-selection sampling, meaning participants voluntarily chose to take part after being made aware of the survey. While this introduces potential bias, efforts to include diverse academic levels and disciplines helped improve the breadth of perspectives. Since participants self-selected into the study, certain groups of students may be overrepresented or underrepresented in the data. Also, non-random sampling and low response rates, reducing representativeness and small sample size, restricting inferential power. Findings are therefore exploratory and indicative rather than representative of the broader student population.

2. Qualitative depth

Open-ended responses were brief, but systematic coding, frequency counts, and inclusion of illustrative quotes improved the richness of analysis.

3. Gender and discipline imbalance

The demographic profile of the respondents does not fully reflect the actual student populations at the two universities. For example, there was a gender imbalance in the responses, and the

distribution of disciplines among participants did not align with the official statistics. These imbalances may have influenced findings related to user preferences and attitudes, as prior research suggests that both gender and academic discipline can shape technology adoption. To address this, the results are presented as indicative of trends within the sample rather than representative of the wider student populations. Future research should apply stratified or quota sampling methods to secure more balanced demographic coverage.

4. No institutional comparisons

Due to unequal participation rates between universities (53 from Borås vs. 33 from Luleå), any direct statistical comparisons between institutions would be misleading. As a result, the study focuses on overall patterns of e-book usage rather than university-specific differences.

5. Dependence on self-reported data

As responses reflect students' self-perceptions, some degree of reporting bias may exist. This was mitigated by triangulating quantitative results with qualitative themes.

6. Reliability not statistically tested

No measures such as Cronbach's alpha or inter-coder reliability were conducted. Instead, reliability was supported through structured design and consistent administration, which ensures a degree of practical reliability but does not replace formal statistical testing. As this was a single-author thesis, coding was performed by the researcher alone, which ensured consistency in applying codes but meant that inter-coder reliability could not be established.

7. Differences in recruitment methods

Borås students were reached via official channels (SUNET), while Luleå students were recruited through social media (Facebook). This variation likely influenced response rates and levels of participation. To minimise bias, results are reported in aggregated form rather than by direct comparison between universities.

5. Results

This section presents the findings of the study on e-book usage among students at the University of Borås and Luleå University of Technology. The results are structured to directly address the research questions and clustered under each research question. The section describes a detailed exploration of e-book usage patterns, factors influencing adoption, and students' perceptions of accessibility and effectiveness.

The study surveyed a total of 86 students (male-38, female-48), with an equal number of undergraduate and graduate participants (43 each). Respondents were from different academic backgrounds, reflecting a diverse range of experiences with e-books.

5.1 Quantitative results

5.1.1 Demographic profile of respondents

Age and gender distribution of respondents

To understand e-book usage patterns, adoption factors, and user perceptions, it is important to consider the demographic distribution of respondents. Age and gender can influence students' experiences with digital resources, affecting their preferences, accessibility concerns, and engagement with e-books.

Age distribution and its relevance to e-book usage

The respondents in this study were categorised into the following age groups: 18–21, 22–25, 26–30, and over 30. These age categories were chosen to reflect key academic stages and variations in e-book usage. Younger students may have limited prior exposure to digital academic resources, whereas older students, especially postgraduates and lifelong learners may rely more heavily on e-books for research and professional development. Analysing e-book usage within these age groups helps identify potential trends in accessibility, frequency of use, and perceived effectiveness.

However, without a breakdown of the actual number of respondents per age group, this analysis lacks context. To improve the study's representativeness, future research should compare these findings against institutional demographic data to assess whether the sample accurately reflects the broader student population.

Gender distribution and missing figures

Gender differences may also play a role in e-book adoption and perception. However, this study does not provide a gender breakdown of respondents, which limits deeper analysis of potential differences in e-book engagement.

Since this study does not compare universities directly, the focus is on overall trends in e-book usage rather than institutional differences. However, to strengthen the validity of demographic findings, it would be beneficial to report the exact number of respondents per age group and gender. In future research, comparing these figures with publicly available university demographic reports could help contextualise the results more effectively.

5.1.2 Patterns of e-book usage (What are the specific patterns of e-book usage among students?)

In line with the study design (Section 4.3), usage patterns are examined across multiple dimensions: frequency, duration, devices, formats, language, and prior experience. The analysis below begins with frequency as the most prominent indicator, followed by other aspects of usage.

The results (Figure 5) indicate varied patterns in e-book usage among students. The most common frequencies reported were several times a month (30%) and several times a week (27%), demonstrating that e-books are integrated into students' study routines but are not necessarily their primary resource. 20% of respondents reported using e-books once a week, while 19% stated that they rarely use them. Only 5% indicated daily use of e-books.

These findings suggest that e-books serve as supplementary study materials rather than a primary academic resource. The usage patterns may be influenced by factors such as course requirements, institutional access, and students' personal preferences for print or digital formats. Furthermore, the differences in frequency of use may reflect variations in digital learning habits, academic disciplines, and accessibility of e-books within university libraries.

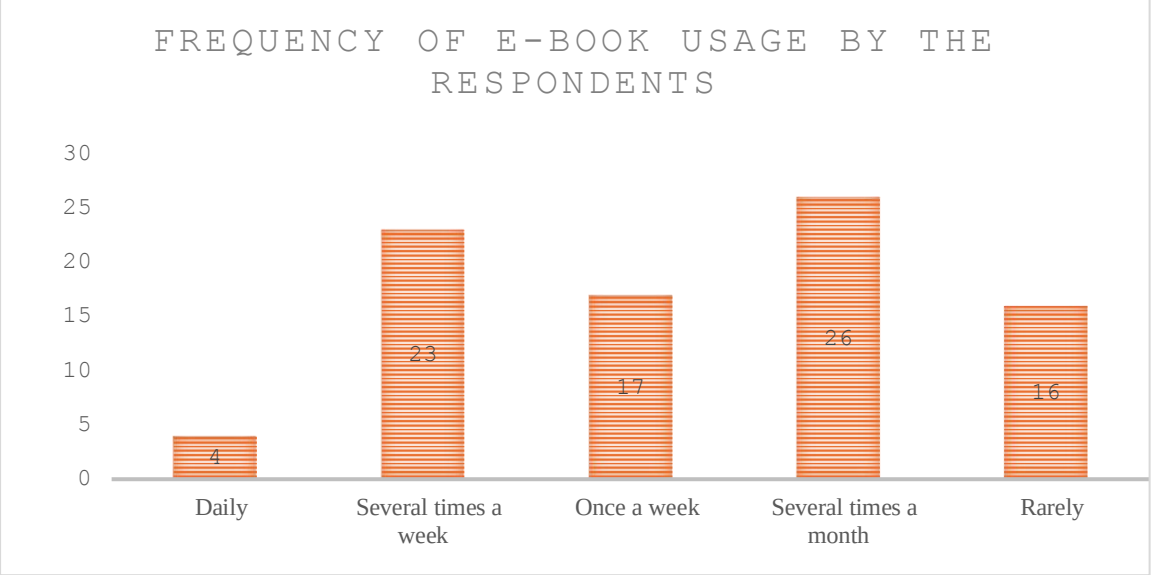

Figure 5. *Frequency of e-book usage among students at Swedish universities.*

The duration of e-book usage sessions (Figure 6) among students varies significantly, highlighting different engagement levels with e-book reading. The largest proportion of respondents reported using e-books for 30 minutes to 1 hour per session (40%), suggesting that e-books are primarily used for short to moderate reading tasks. Additionally, a notable percentage indicated 1-2 hours sessions (26%), reflecting more extended engagement, possibly for academic research or focused study periods.

On the other hand, a smaller portion of respondents reported shorter engagement times of 15-30 minutes (17%), while a lower percentage stated that they spend more than 2 hours per session (12%) on e-books. A minimal fraction mentioned using e-books for less than 15 minutes (6%), indicating limited interaction with digital resources.

These findings suggest that while many students use e-books in focused study sessions, prolonged engagement is less common. Factors such as screen fatigue, reading preferences, and ease of navigation within e-books could influence session duration. Further analysis could explore whether session length correlates with academic discipline, year of study, or the availability of printed alternatives, helping to refine strategies for enhancing e-book usability in university libraries.

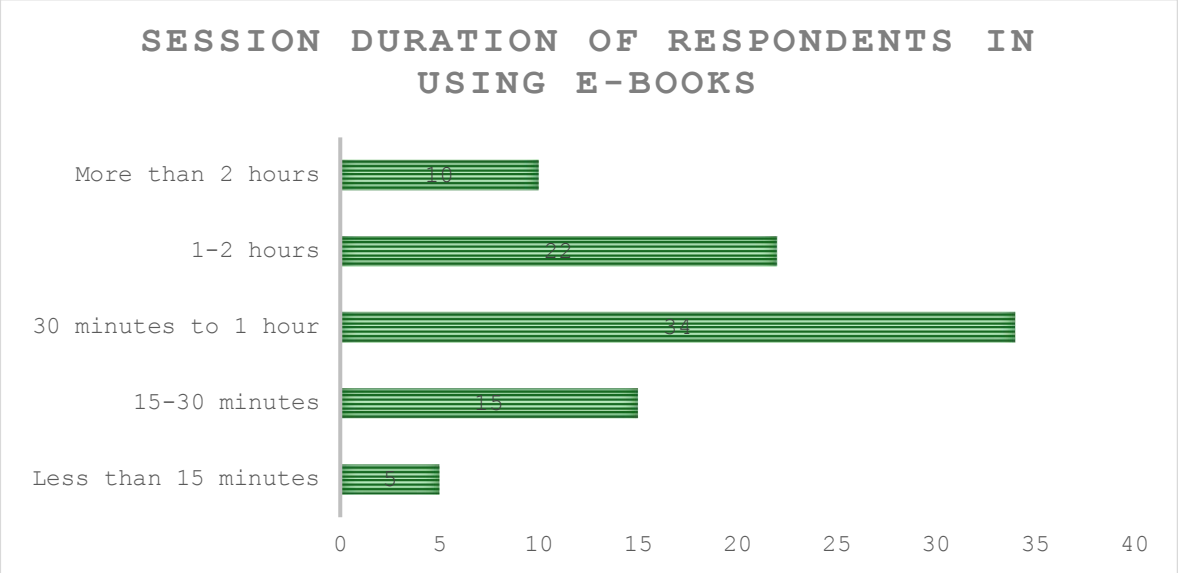

Figure 6. *Duration of typical e-book usage sessions among students.*

Respondents reported varying levels of experience (Figure 7) with e-books, indicating diverse familiarity and comfort levels with digital reading. A considerable proportion of respondents have been using e-books for an extended period, with 35% having more than five years of experience. This suggests a well-established user base that is likely proficient in navigating digital resources.

Additionally, 29% of respondents reported using e-books for 3-5 years, demonstrating a significant portion of users with moderate experience. Meanwhile, 23% indicated having 1-2 years of experience, reflecting a group still in the process of adapting to digital reading. A

smaller percentage, 13%, reported using e-books for less than a year, suggesting that a fraction of students are relatively new to this format.

These findings highlight that while a majority of students have substantial experience with e-books, a portion still requires further adaptation and potential support to optimise their usage. Libraries and universities could consider offering training or orientation sessions to help newer users develop effective digital reading strategies.

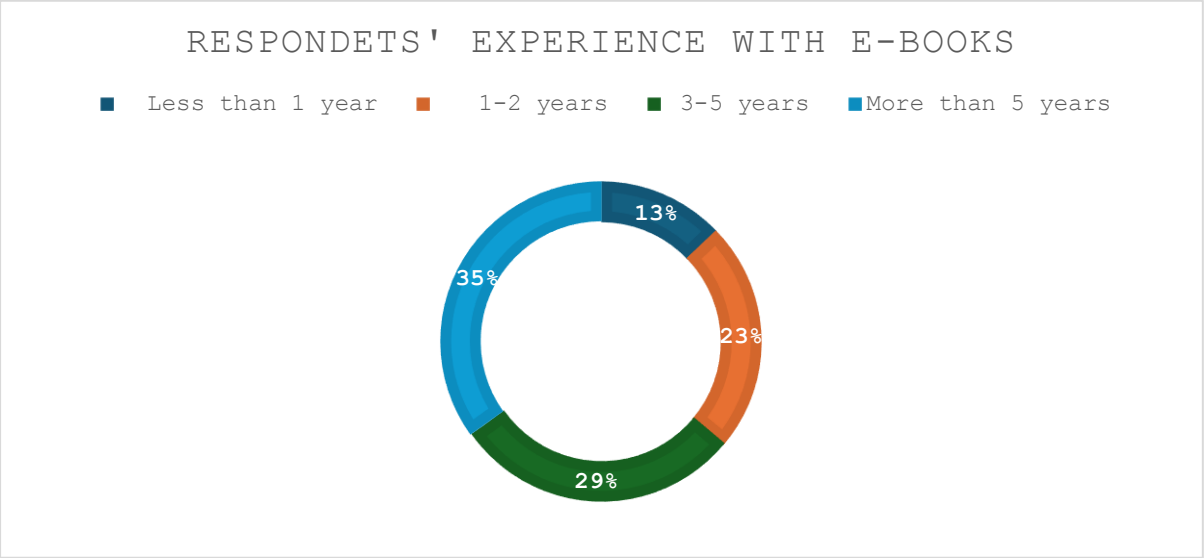

Figure 7. *Respondents' years of experience using e-books.*

The analysis of device usage (Figure 8) for reading e-books highlights a strong preference for laptops, which account for 52% of total device selections. This dominance suggests that students prioritise laptops due to their larger screens, multitasking capabilities, and compatibility with academic resources.

Desktop computers, tablets, and smartphones each make up 15% of the total selections, indicating that students use a mix of devices depending on availability and convenience. Desktop computers may be used in library settings, while tablets and smartphones offer portability, making them suitable for on-the-go reading.

E-readers remain the least utilised, representing only 3% of selections. This suggests that dedicated e-reading devices do not align well with students' academic needs, possibly due to limited functionality, restricted format support, or institutional access barriers. No respondents reported using other devices.

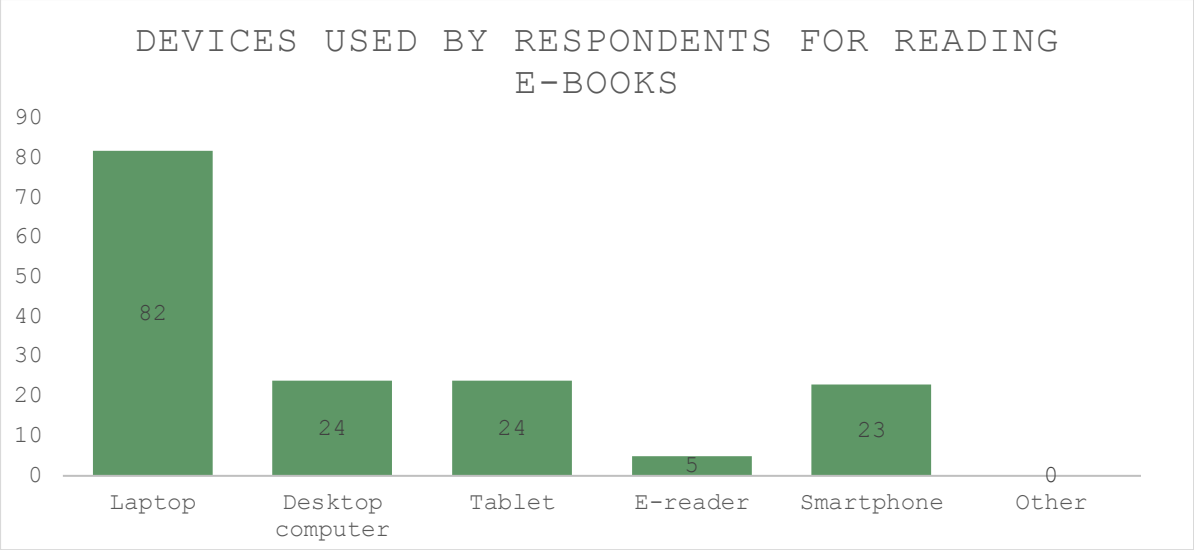

Figure 8. *Devices used by students for reading e-books.*

The findings (Figure 9) indicate a clear preference for PDF, which makes up 75% of the total format selections. This overwhelming majority suggests that students prioritise PDFs for their fixed layout, easy navigation, and broad compatibility across devices, making them the most practical choice for academic reading.

EPUB follows as the second-most preferred format, representing 18% of selections. While EPUB offers reflowable text and better adaptability to different screen sizes, its lower preference indicates that students may not find it as widely supported or as convenient as PDF for academic use.

MOBI and HTML formats each account for 4% of the total selections, suggesting that these formats have limited awareness or institutional availability. The lack of preference for other formats further highlights the dominance of PDF and, to a lesser extent, EPUB.

These results underscore the need for universities and digital library services to prioritise e-book accessibility in PDF format, given its widespread acceptance among students. Additionally, the moderate preference for EPUB suggests that it could serve as an alternative format if more institutional support and awareness are provided.

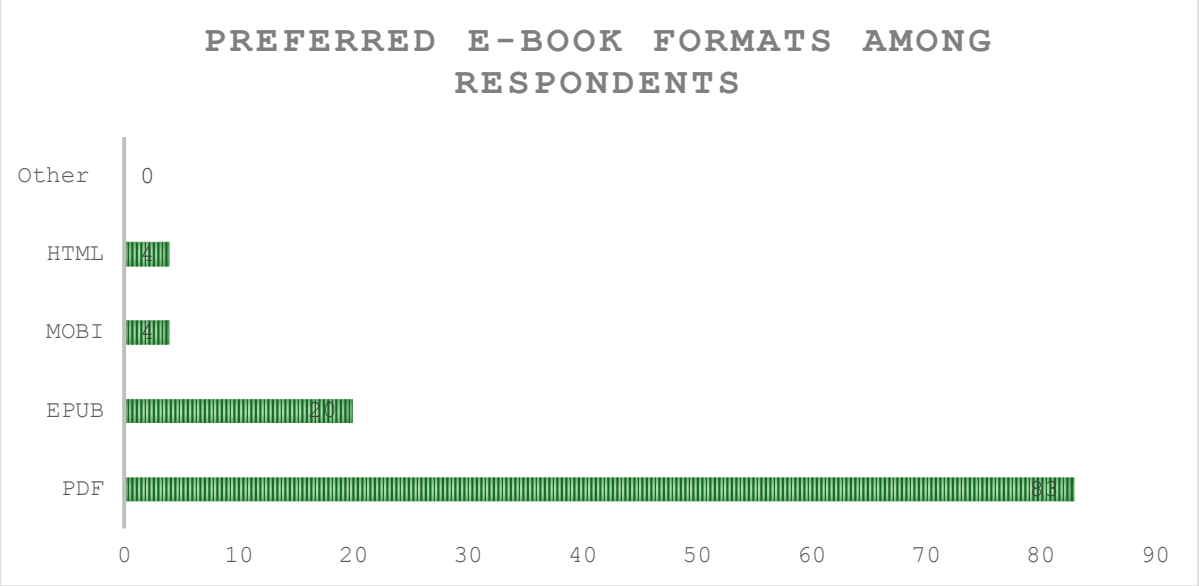

Figure 9. *Preferred e-book formats among university students.*

The analysis of language preferences (Figure 10) for reading e-books shows a clear dominance of English, which accounts for approximately 59% of all language selections. This suggests that a majority of respondents prefer reading in English, likely due to the availability of content and ease of access. Swedish follows as the second most commonly used language, making up around 34% of the total selections, reflecting a strong regional preference.

The remaining 7% is distributed among other languages, each with significantly lower representation. Spanish accounts for 2%, while German, Finish, Turkish, Greek, and other Nordic languages each contribute 1%. These findings suggest that while there is some degree of multilingualism among respondents, the use of languages other than English and Swedish is minimal.

The fact that some respondents read in multiple languages indicates flexibility in language preference, yet the overwhelming dominance of English suggests it remains the primary medium for e-book consumption. Swedish, while significantly lower than English, still holds a substantial share, whereas other languages appear to be used only occasionally.

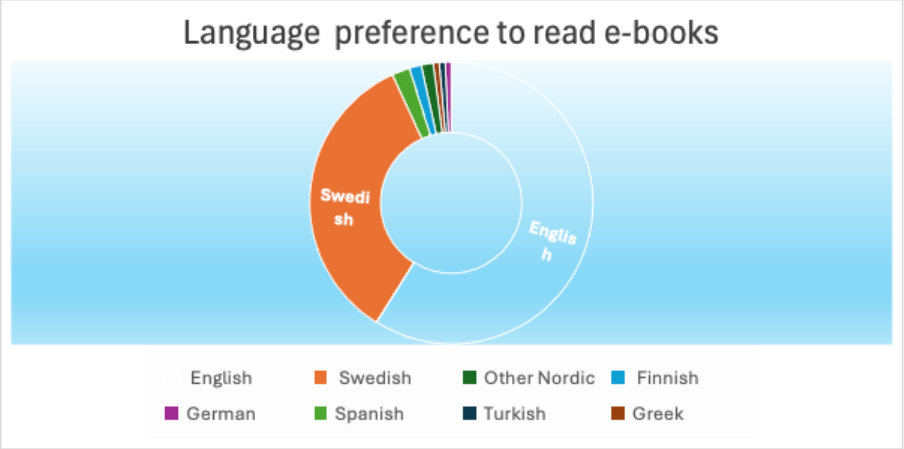

Figure 10. *Language preferences for reading e-books.*

5.1.3 Factors influencing e-book adoption (What factors contribute to variations in e-book adoption?)

Figure 11 presents responses to the survey item: 'My prior experience with digital technologies (e.g., learning platforms, software, apps) makes it easier and more effective for me to use e-books.' The analysis reveals that half of the respondents (50%) agreed with this statement, while 11% strongly agreed. A substantial proportion (38%) neither agreed nor disagreed, and only 1% selected 'strongly disagree.' No respondents selected 'disagree.' These findings suggest that many students perceive their prior digital experience as beneficial for engaging with e-books, although a large share remained neutral, possibly reflecting limited confidence in attributing their e-book use to prior digital exposure.

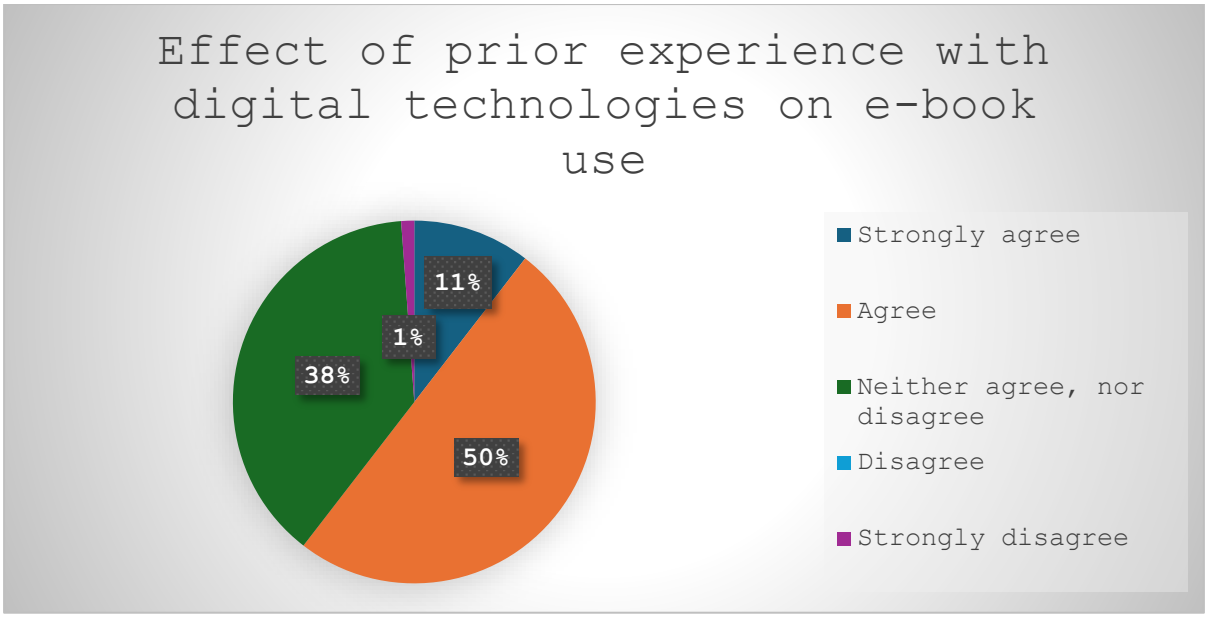

Figure 11. *Impact of prior experience with digital technologies on e-book usage.*

The analysis of ease of access to e-books (Figure 12) in the university library shows that 55% of respondents agree that access is convenient, while 20% strongly agree, indicating that a significant majority find the system accessible and user-friendly.

However, 15% neither agree nor disagree, suggesting that for some, access may not be a major concern or may vary based on specific circumstances. 10% disagree, indicating some dissatisfaction with accessibility, though no respondents strongly disagreed.

Overall, the findings suggest that most users perceive e-book access in the university library as convenient, though a small portion experiences difficulties.

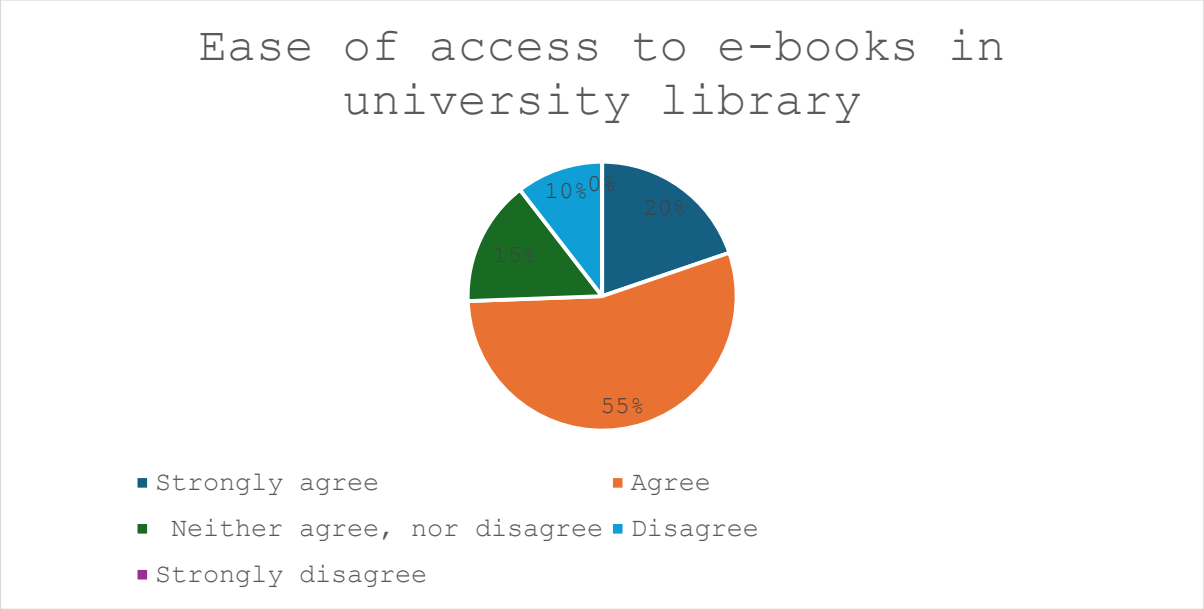

Figure 12. *Students' perceptions of ease of access to e-books in university libraries.*

The analysis of library e-book provision for students (Figure 13) indicates that 42% of respondents agree that the library provides sufficient e-books, while 12% strongly agree, suggesting that more than half of the respondents are satisfied with the availability of e-books. 24% neither agree nor disagree, implying that a considerable portion of students may have mixed or neutral opinions on the adequacy of e-book provisions. 21% disagree, indicating notable dissatisfaction with the library's e-book offerings, while 1% strongly disagree, reflecting a small but critical view.

while a majority perceive the provision of e-books as adequate, a significant minority express concerns, suggesting room for improvement in accessibility or availability.

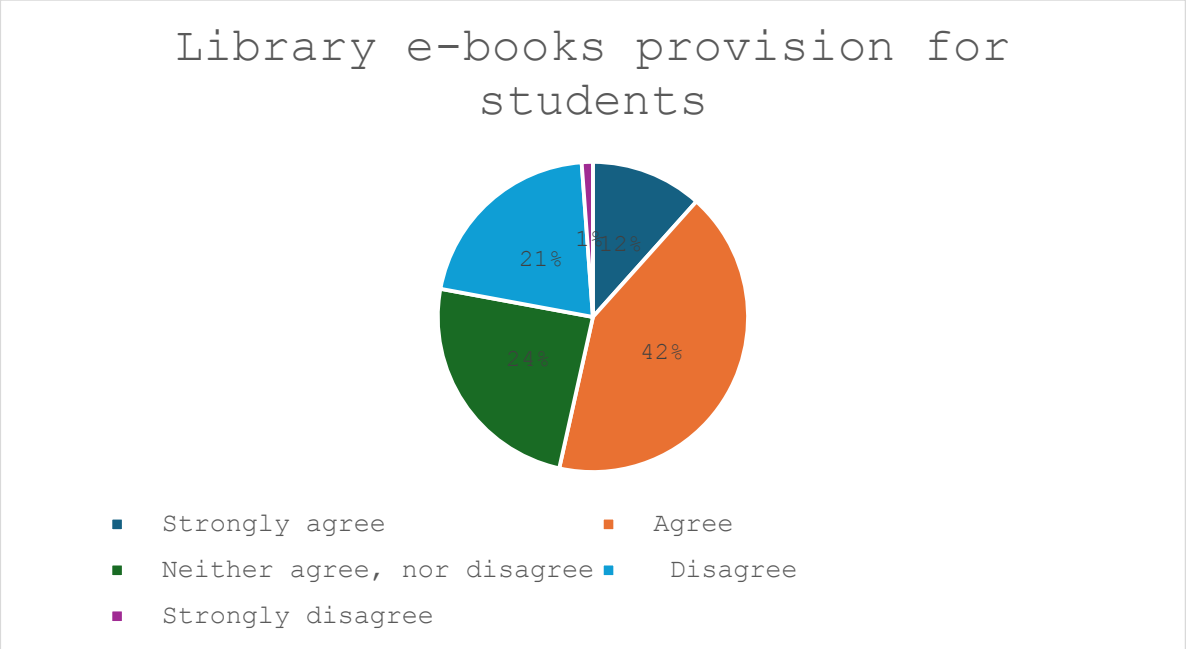

Figure 13. *Students' perceptions of library e-book provision and availability.*

5.1.4 Perceptions of accessibility and effectiveness (How do students perceive the accessibility and effectiveness of e-books?)

The analysis of satisfaction levels (Figure 14) reveals that 44% of respondents are satisfied, while 26% are very satisfied, indicating that a majority hold a positive view. 27% remain neutral, suggesting that a significant portion neither finds the service particularly good nor bad. Meanwhile, 3% of respondents are dissatisfied, and no respondents reported being very dissatisfied.

Overall, the results indicate a generally favourable perception, with most respondents expressing satisfaction, though a notable share remains indifferent.

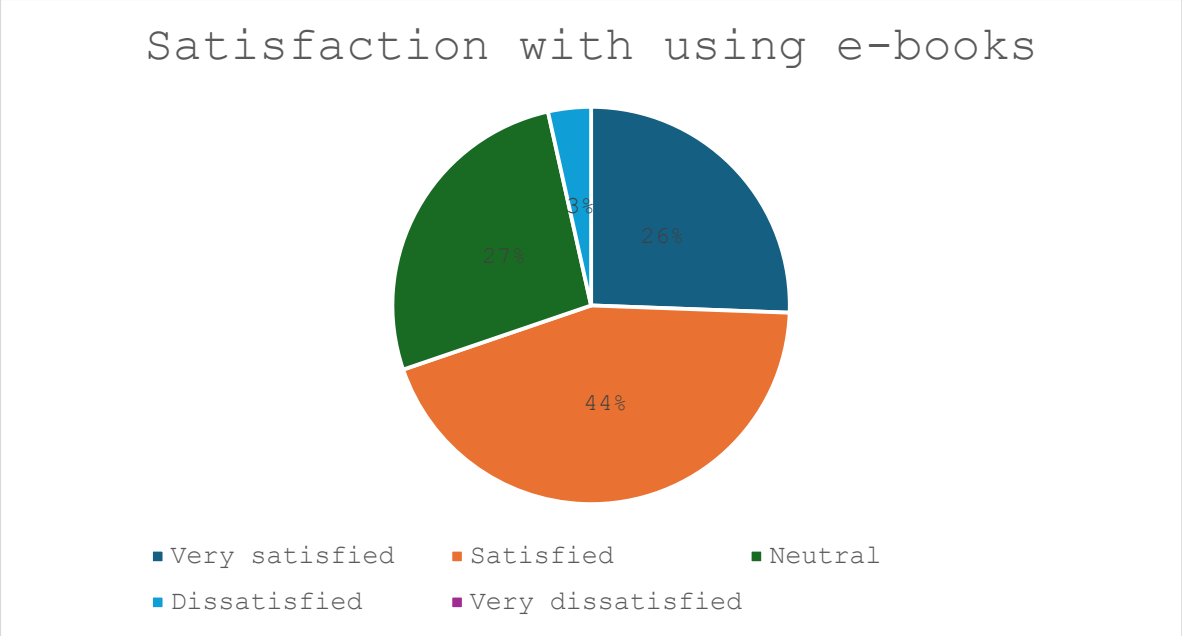

Figure 14. *Overall student satisfaction with e-books.*

The analysis of perceptions regarding e-book quality compared to print books (Figure 15) shows a nearly even split between those who view them as equal (45%) and those who consider e-books better (41%). This suggests that a majority of respondents perceive e-books as either comparable to or superior to print books in terms of quality. However, 14% believe e-books are worse than print books, indicating that a minority still prefer traditional formats due to potential concerns such as readability, usability, or overall experience.

Overall, the findings suggest a strong acceptance of e-books, with most respondents viewing them positively, though a small portion still favours print books.

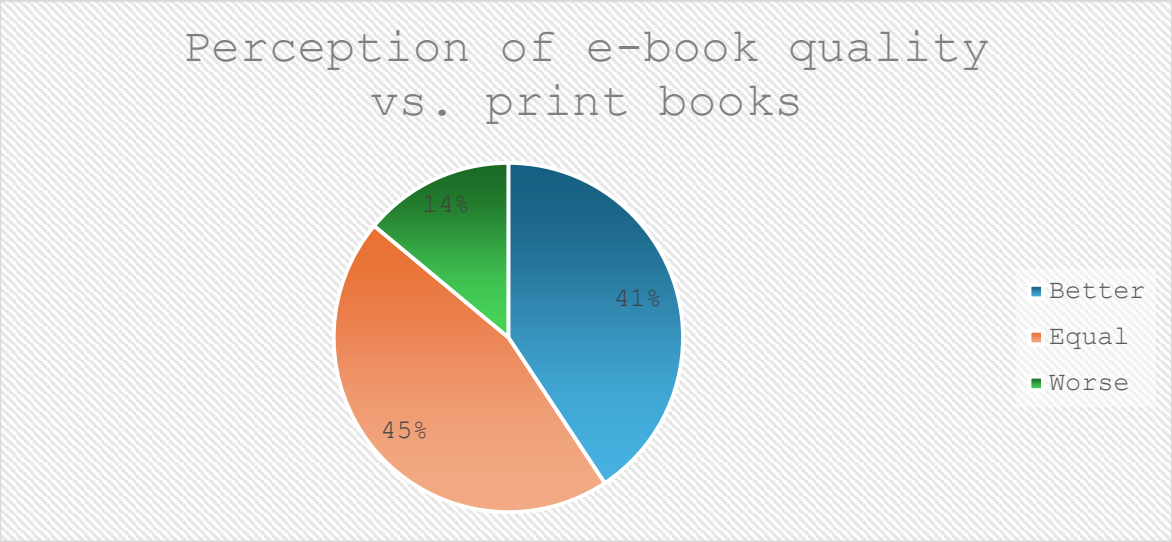

Figure 15. *Comparison of perceived quality between e-books and printed books.*

The survey results (Figure 16) indicate that a majority of respondents (61%) find e-books more convenient than print books. This preference suggests that students appreciate the accessibility, portability, and instant availability of digital resources, which align well with academic needs. However, 31% of respondents believe that both e-books and print books are equally convenient. This response implies that some students recognise the advantages of both formats.

A small percentage of respondents (8%) consider print books to be more convenient than e-books. This minority preference may stem from factors such as reading comfort, ease of annotation, or a preference for physical interaction with books.

The results highlight a strong inclination towards e-books for convenience, though a significant portion of students still value print books or see both formats as equally beneficial.

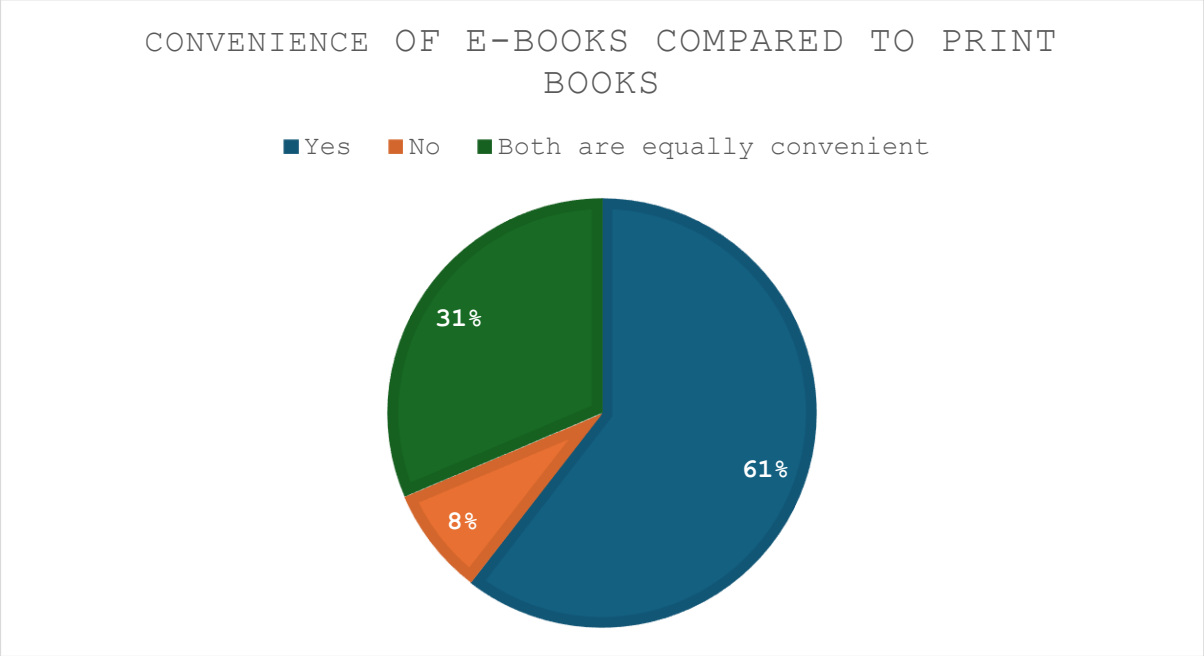

Figure 16. *Perceived convenience of e-books compared with printed books.*

5.1.5 Results of statistical data analysis

5.1.5.1 Regression analysis

Regression analyses are conducted to investigate the relationships between various independent variables, such as library e-books provision, effect of digital tools on e-book usage, and academic level with corresponding dependent variables including frequency of e-book usage, ease of access to e-books, and user satisfaction. These analyses help to examine the strength and nature of these relationships, contributing to a deeper understanding of e-book utilisation patterns.

Regression analysis 1: Effect of digital tools on e-book usage and satisfaction with e-books

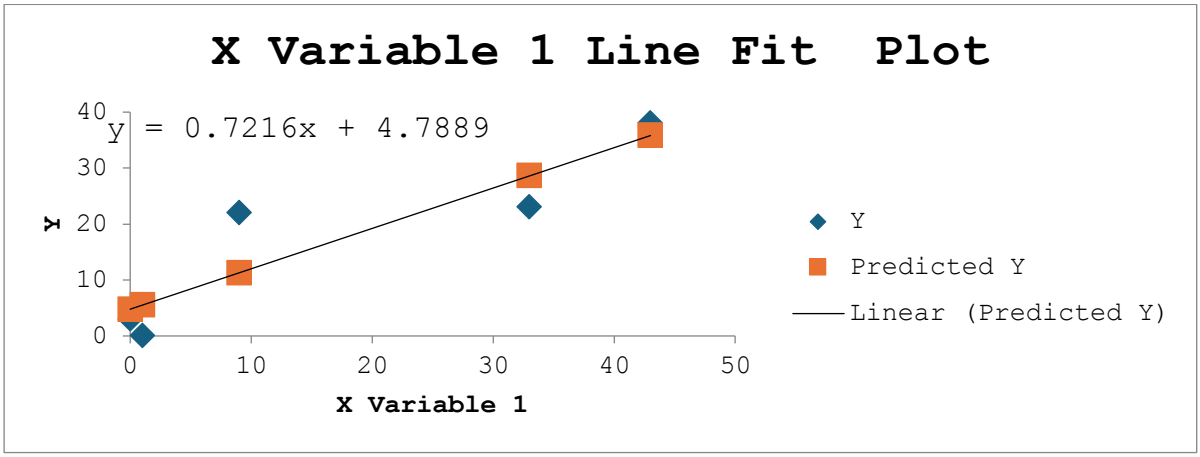

Figure 17. *Regression analysis: Effect of digital tools on students' satisfaction with e-books.*

The regression analysis examined the relationship between the effect of digital tools and students' satisfaction with e-books. The results indicate a strong positive correlation, with a multiple R of 0.9017 and an R square value of 0.8130, suggesting that approximately 81% of the variation in satisfaction with e-books can be explained by the effect of digital tools. The regression equation, y = 0.7216x + 4.7889 implies that for every one-unit increase in the effect of digital tools, satisfaction with e-books increases by 0.7216 units. The model's F-statistic is 13.04, with a significance value of 0.0365, indicating that the relationship is statistically significant at the 5% level. Furthermore, the coefficient for the independent variable (0.7216) is significant, with a p-value of 0.0365, reinforcing the strong association between digital tools and e-book satisfaction.

However, the intercept (4.7889) is not statistically significant (p = 0.4014), suggesting that other factors may contribute to students' satisfaction with e-books.

Regression analysis 2: Ease of accessing e-books and satisfaction with e-books

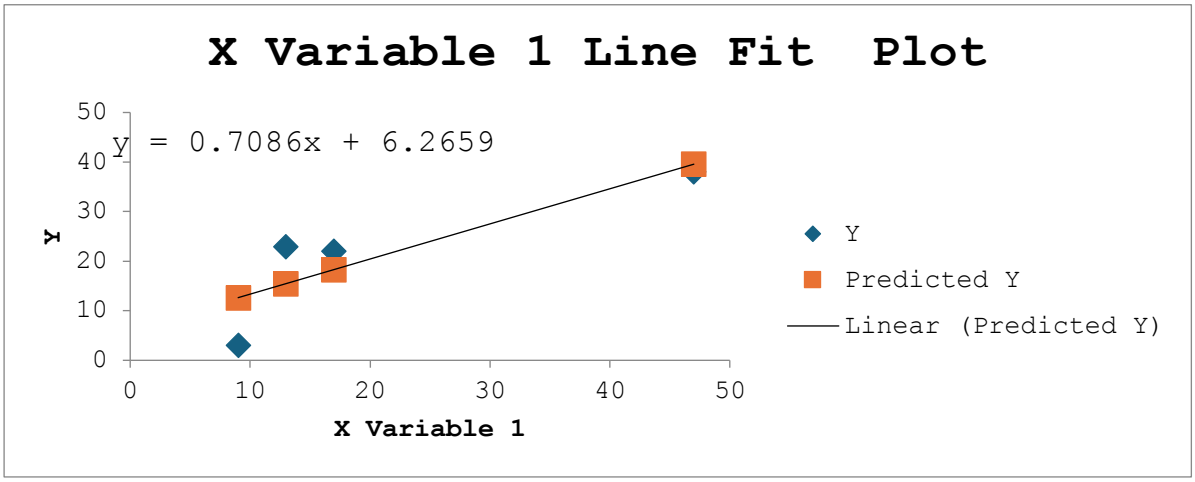

Figure 18. *Regression analysis: Relationship between ease of access and satisfaction with e-books.*

The regression analysis explored the relationship between the ease of accessing e-books and students' satisfaction with e-books. The results indicate a strong positive correlation, with a multiple R of 0.8553 and an R square of 0.7315, meaning that approximately 73% of the variation in satisfaction with e-books can be explained by the ease of access. The regression equation, y = 0.7086x + 6.2659 suggests that for every one unit increase in ease of access, satisfaction with e-books increases by 0.7086 units.

However, the model's F-statistic is 5.45 with a significance value of 0.1447, indicating that the relationship is not statistically significant at the 5% level. The coefficient for ease of access (0.7086) has a p-value of 0.1447, suggesting that its effect on satisfaction is not strongly significant. Similarly, the intercept (6.2659) has a high p-value (0.5134), implying that additional factors may influence students' satisfaction with e-books beyond ease of access.

Regression analysis 3: Library e-books provision and satisfaction with e-books

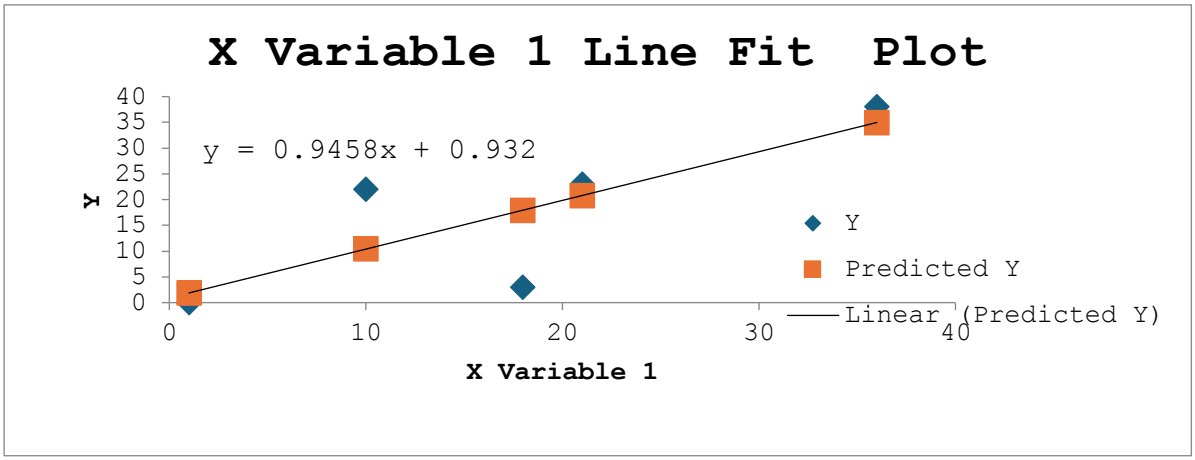

Figure 19. *Regression analysis: Relationship between library e-book provision and satisfaction with e-books.*

The regression analysis examined the relationship between library e-book provision and students' satisfaction with e-books. The results show a moderately strong positive correlation, with a multiple R of 0.7867 and an R square of 0.6190, indicating that about 62% of the variation in satisfaction can be explained by library e-book provision. The regression equation, y = 0.9458x + 0.932 suggests that for every one unit increase in library e-book provision, satisfaction with e-books increases by 0.9458 units.

However, the F-statistic is 4.87 with a significance value of 0.1144, indicating that the relationship is not statistically significant at the 5% level. The coefficient for library e-book provision (0.9458) has a p-value of 0.1144, suggesting that its effect on satisfaction is not strongly significant. Similarly, the intercept (0.932) has a high p-value (0.9233), implying that other factors may play a significant role in shaping students' satisfaction with e-books beyond the provision of e-books by the library.

Regression analysis 4: Respondents' experience with e-books and session duration in using e-books

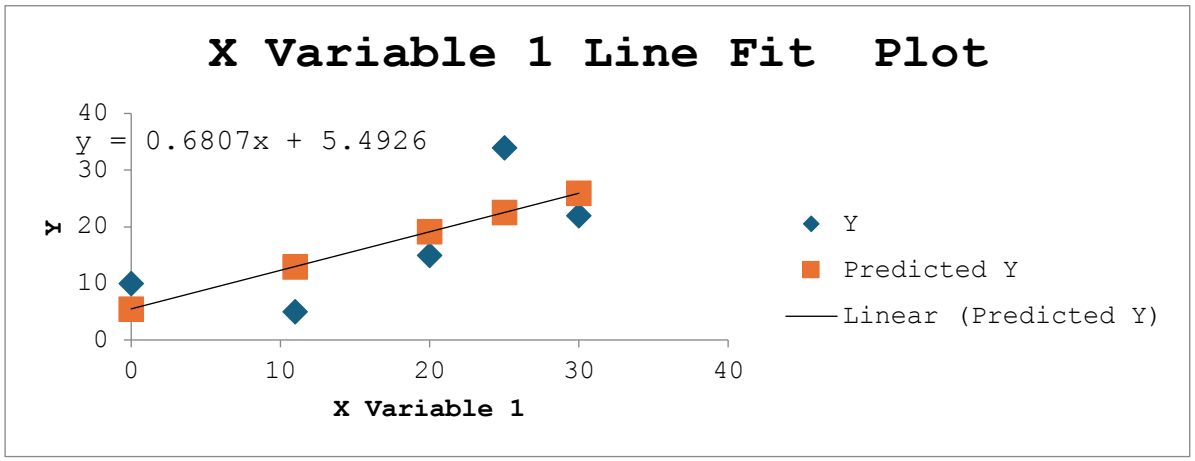

Figure 20. *Regression analysis: Relationship between e-book experience and session duration.*

The regression analysis examined the relationship between respondents' experience with e-books and their session duration. The results show a moderately strong positive correlation, with a multiple R of 0.7170 and an R square of 0.5141, indicating that about 51% of the variation in session duration can be explained by experience with e-books. The regression equation y = 0.6807x + 5.4926 suggests that for every one unit increase in experience, session duration increases by 0.6807 units. However, the F-statistic is 3.1741 with a significance value of 0.1728, indicating that the relationship is not statistically significant at the 5% level. The coefficient for experience (0.6807) has a p-value of 0.1728, suggesting that its effect on session duration is not strongly significant.

Similarly, the intercept (5.4926) has a high p-value (0.5285), implying that other factors may play a significant role in determining session duration beyond respondents' experience with e-books.

Regression analysis 5: Respondents' academic level and ease of accessing e-books

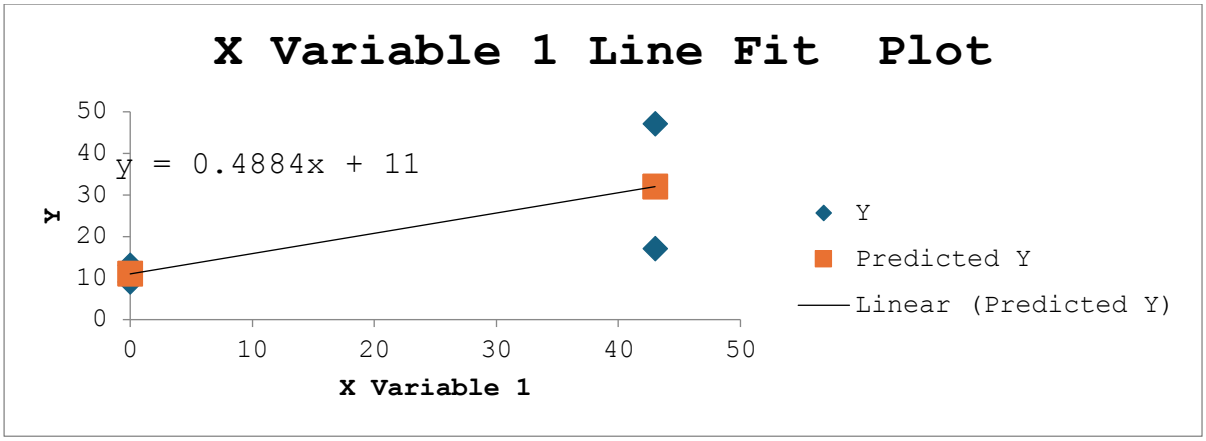

Figure 21. *Regression analysis: Relationship between academic level and ease of accessing e-books.*

The regression analysis examined the relationship between academic level and ease of accessing e-books. The results show a moderately strong positive correlation, with a multiple R of 0.7004 and an R square of 0.4905, indicating that about 49% of the variation in ease of access can be explained by academic level. The regression equation y = 0.4884x + 11 suggests that for every one unit increase in academic level, ease of accessing e-books increases by 0.4884 units.

The F-statistic is 1.9258 with a significance value of 0.2996, indicating that the relationship is not statistically significant at the 5% level. The coefficient for academic level (0.4884) has a p-value of 0.2996, suggesting that its effect on ease of access is not strongly significant. Similarly, the intercept (11) has a high p-value (0.4120), implying that other factors may play a significant role in determining the ease of accessing e-books beyond academic level.

Regression analysis 6: Respondents' academic discipline and e-book usage frequency

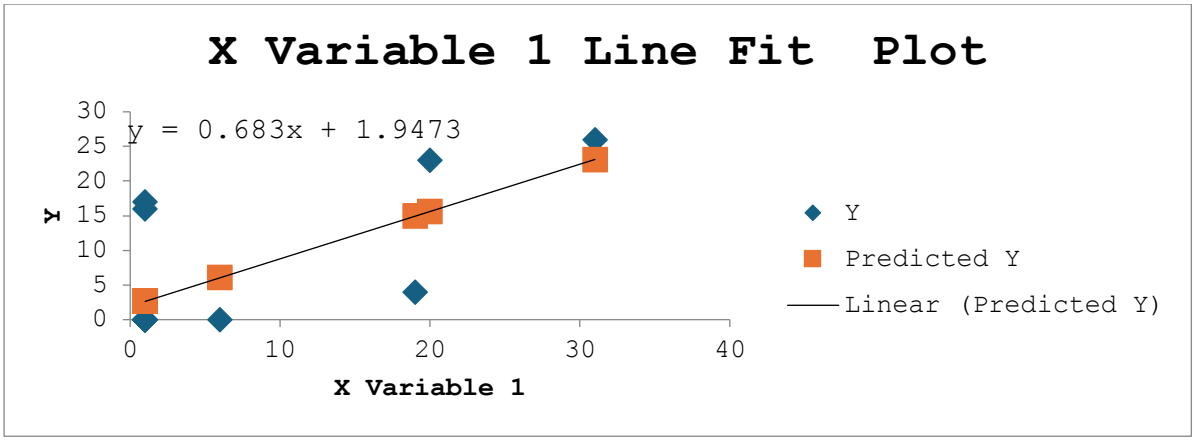

Figure 22. *Regression analysis: Relationship between academic discipline and frequency of e-book usage.*

The regression analysis examined the relationship between academic discipline and e-book usage frequency. The results show a moderately strong positive correlation, with a multiple R of 0.6835 and an R square of 0.4672, indicating that 46.72% of the variation in e-book usage frequency can be explained by academic discipline. The regression equation y = 0.683x + 1.9473 suggests that for every one unit increase in academic discipline, e-book usage frequency increases by 0.683 units. The F-statistic is 10.5238 with a significance value of 0.0070, indicating that the relationship is statistically significant at the 1% level. The coefficient for academic discipline (0.6830) has a p-value of 0.0070, suggesting a significant effect on e-book usage frequency.

The intercept (1.9473) has a high p-value (0.4265), implying that other factors may also contribute to variations in e-book usage frequency beyond academic discipline.

5.1.5.2 Chi-square test

In this study, the chi-square test was applied to assess whether the observed frequencies of e-book usage across different categories deviate significantly from the expected distribution. By comparing observed and expected values, the analysis evaluates whether factors such as institutional characteristics, device preferences, and file format choices influence students' engagement with e-books. A significance level of **0.05** was used to determine whether the differences are statistically meaningful. The results of the chi-square tests for each hypothesis are presented below. Here, regression analysis was employed to test hypothesis 1 only; p-value was calculated through regression analysis of two variables.

Hypothesis 1: Students with greater exposure to digital learning tools will exhibit higher satisfaction and more frequent e-book usage.

A regression analysis was conducted to examine the relationship between students' use of digital tools and their satisfaction with e-books. The observed values for digital tool usage were 9, 43, 33, 0, and 1, while the corresponding satisfaction levels were 22, 38, 23, 3, and 0.

The regression model showed a multiple R of 0.90 and an R^2 of 0.81, indicating a strong relationship between digital tool usage and satisfaction. The regression coefficient for digital tool usage was 0.72, with a p-value of **0.036,** which is below the 0.05 significance level.

As a result, the null hypothesis is rejected, suggesting a statistically significant relationship between digital tool usage and satisfaction with e-books. These findings support hypothesis 5, indicating that students with greater exposure to digital tools tend to have higher satisfaction with e-books. This could be due to their familiarity with digital learning environments, which may enhance their ability to navigate, utilise, and benefit from e-book resources more effectively.

Hypothesis 2: E-book usage frequency will vary based on institutional characteristics, including library resources and digital literacy support.

A chi-square test of independence was performed to examine the variation in e-book usage frequency among students based on institutional characteristics. The observed frequencies were 4 for daily usage, 23 for several times a week, 17 for once a week, 26 for several times a month, and 16 for rarely, with an expected frequency of 17.2 for each category. The analysis yielded a p-value of **0.00224,** which is below the 0.05 significance level. Therefore, the null hypothesis is rejected, indicating a statistically significant difference in e-book usage frequency among students. This suggests that institutional characteristics, such as library resources and digital literacy support, play a role in shaping students' engagement with e-books, leading to uneven distribution across usage categories.

Hypothesis 3: Laptops will be the most used device for reading e-books in university libraries.

A chi-square test of independence was conducted to examine the distribution of e-book reading devices among students. The observed frequencies were 82 for laptops, 24 for desktop computers, 24 for tablets, 5 for e-readers, and 23 for smartphones, with an expected frequency of 31.6 for each category. The analysis resulted in a p-value of $\mathbf{1.33 \times 10^{-22}}$, which is far below the 0.05 significance level. Therefore, the null hypothesis is rejected, indicating a statistically significant difference in the distribution of device usage. This suggests that students do not use all devices equally for e-book reading, with laptops being the most preferred device, strongly supporting hypothesis 3.

Hypothesis 4: PDFs will be the preferred file format among students due to accessibility and functionality.

A chi-square test of independence was conducted to analyse students' preferences for e-book file formats. The observed frequencies were 83 for PDF, 20 for EPUB, 4 for MOBI, and 4 for HTML, with an expected frequency of 27.75 for each category. The test yielded a p-value of $\mathbf{6.49 \times 10^{-33}}$, which is far below the 0.05 significance level. As a result, the null hypothesis is rejected, indicating a statistically significant difference in file format preferences. These

findings support hypothesis 4, demonstrating that students overwhelmingly prefer the PDF format over other file types, likely due to its accessibility and functionality.

Hypothesis 5: Undergraduate and graduate students will demonstrate different e-book usage patterns, with graduate students showing higher engagement.

A chi-square test of independence was conducted to analyse the relationship between students' academic level (undergraduate vs. graduate) and their engagement with e-books. The observed and expected frequencies were identical for both groups (43 each), yielding a p-value of **1.** Since this value is far above the 0.05 significance level, the null hypothesis cannot be rejected. This indicates that there is no statistically significant difference in e-book engagement between undergraduate and graduate students. These findings do not support hypothesis 5, suggesting that students' prior experiences with digital learning tools do not lead to variations in e-book usage based on academic level. These findings imply that academic level may not be a determining factor in e-book usage, and other influences, such as institutional resources or study habits, might play a more significant role.

5.2 Qualitative findings

Databases and platforms for accessing e-books

Respondents reported accessing e-books through a variety of platforms, with the EBSCO eBook Collection emerging as a common resource at both institutions. At the same time, students mentioned using platforms such as Ebook Central, ProQuest, JSTOR, MIT, O'Reilly, SAGE, Wiley, Elib, and Legimus, reflecting a broad spectrum of available resources. Some respondents highlighted the use of OPAC and Primo as main discovery tools, while LISA/LISTA was noted by information science students.

However, across both universities, a notable share of respondents stated *'I do not know'* when asked which databases they used, suggesting gaps in user awareness and pointing to the need for clearer visibility of, or training in, available e-book platforms.

This uncertainty suggests that although the technical infrastructure exists, students are not always aware of which gateway they are using or how to navigate effectively. As one student put it, *'I just click whatever the library page shows me - I don't know which database it is.'* This indicates that for many students, the library catalogue functions as a 'black box', connecting them to resources without them fully understanding the underlying platforms.

Perceptions of e-book quality compared to print

Students revealed heterogeneous views regarding the use of e-books relative to print texts. A clear advantage mentioned was the technical functionality of e-books, such as searchability, annotation, and zooming features, which were valued especially in academic contexts. Respondents appreciated being able to download PDFs for later use, save space, and locate

information quickly. One respondent explained: *'When I study, I use the search function constantly - it saves me hours compared to flipping through a printed index.'*

Nevertheless, concerns were also raised. Some respondents felt that poorly scanned or converted e-books suffered from low visual quality, and several pointed out that reading on a screen for long periods caused eye strain. Comments such as *'Some e-books look like photocopies; the text is blurry and hard to read'* and *'After two hours on the screen my eyes hurt, so I print sections instead'* highlight the challenges of prolonged digital reading. A number of students noted that navigation in print books feels more intuitive for extended reading or when consulting multiple sources. For others, e-books and print books were viewed as largely content-equivalent, but digital reading required greater concentration and was harder to engage with.

Convenience and accessibility of e-books

E-books were widely considered convenient and accessible, primarily because they can be used anytime, anywhere, and do not require a physical visit to the library. Students praised their search functions, which were seen as time-saving and useful for academic work. Many valued being able to access materials from home, abroad, or while commuting. For distance learners and international students, digital access was described as essential rather than optional: '*Without e-books I would not manage, since I live outside Sweden and can't borrow from the library physically.'* Respondents also appreciated that e-books could be accessed at low or no cost through the library, which was especially beneficial for students with financial or geographic constraints. Some respondents noted that they avoided purchasing expensive textbooks thanks to library-provided e-books.

Space-saving and portability were additional advantages, with students noting the ability to carry multiple texts on one device. At the same time, some respondents still preferred print books for longer reading sessions and for ease of annotation, remarking that underlining or writing in margins felt more natural in physical formats.

Accessibility was another important theme. One student highlighted the Legimus format, noting its significance for students with disabilities, who found it improved focus and note-taking. He/she noted: *'Legimus makes it possible for me to actually follow lectures and take notes - without it, I would fall behind.'* This highlights how digital formats can act as inclusive tools when designed with accessibility in mind. Yet, not all materials were available, which led a few students to express frustration, with one admitting: *'I have had to pirate some books because the library doesn't provide them, and they are too expensive.'*

General feedback and suggestions

Students expressed both appreciation and frustration with the current e-book services. Positive comments included recognition of the library's efforts to expand its e-book collections and

gratitude for the variety of digital resources available. Several respondents noted that e-books greatly facilitated their studies, with one explicitly thanking the library for providing them.

Differences in use across academic contexts:

The data suggested subtle differences in how e-books are valued depending on academic purpose. Students found them particularly useful for:

- Searching for key terms in academic readings,
- Quick referencing while writing essays, and
- Accessing multiple sources for assignments without carrying heavy print books.

However, for longer, immersive reading tasks such as literature studies or leisure reading, respondents tended to prefer print. One student reflected: *'For a novel, I want a paper book. But for my thesis, e-books are much more efficient.'* This indicates a hybrid pattern where e-books dominate in academic work, but print retains importance in other reading contexts.
Challenges were also reported:

- Limited availability of required course books, sometimes forcing students to buy or even pirate texts.
- Discrepancies between e-book and print editions, complicating proper citation in coursework.
- Technical frustrations, particularly with the e-book reader software, which respondents said frequently logged them out or timed out unexpectedly. Students described this as disruptive to study flow: *'It's annoying when I'm in the middle of reading and suddenly the platform logs me out.'*
- Confusion between print and e-book catalogue records was another frustration. Some respondents reported difficulty knowing whether a title was available as print or e-book, and occasionally accessed the wrong version by mistake. This reflects a need for clearer catalogue labelling and improved user interface design.
- Eye strain from long hours of digital reading.

Several students suggested improvements:

- Expanding the collection of required e-books to ensure core texts are available online.
- Providing training sessions or seminars, especially for international students, on how to effectively search, access and use e-books.

- Improving technical infrastructure, with more stable e-book reader platforms that do not time out unexpectedly.

- Introducing tagging or thematic grouping of e-books in catalogues, making it easier for students to locate resources relevant to specific courses or subjects.

One student summed it up: *'The e-books are great, but sometimes it feels like we have the tools without the guidance. A little training would make a big difference.'*

Taken together, the qualitative findings reveal that students appreciate the convenience, accessibility, and technical features of e-books, but also struggle with limited availability of required texts, technical issues, and challenges in digital reading comfort. While platforms such as EBSCO and ProQuest are important gateways, many students lack awareness of which databases they use, suggesting a need for improved visibility and user training. Respondents' comments underline both the strengths of e-books in supporting academic work and the areas where libraries could improve services, particularly in ensuring access to core texts, enhancing usability, and supporting students through targeted training.

6. Discussion

This section interprets the findings of the study in relation to the research questions, theoretical framework, and existing literature while acknowledging the study's methodological limitations. Drawing on both quantitative and qualitative strands, the discussion integrates statistical results with thematic insights to provide a comprehensive understanding of e-book usage. The analysis focuses on patterns of adoption, factors influencing acceptance, and students' perceptions, situating the results within the broader context of Library and Information Science (LIS) research and the constructs of TAM2.

6.1Quantitative results

6.1.1 Interpretation of findings

6.1.1.1 E-book usage patterns

The study found that e-books are integrated into students' study routines but are not necessarily their primary resource. The majority of students use e-books several times a month (30%) or several times a week (27%), suggesting that e-books supplement traditional learning methods rather than replace them. So, e-book usage frequency varies, with most students accessing e-books several times a month, while fewer use them daily or weekly. This suggests that e-books are valued but not yet fully integrated into students' daily academic routines, as many still rely on print materials for in-depth study. Fry (2020) noted that e-book adoption increases over time as students become more accustomed to digital learning.

Additionally, the duration of e-book usage sessions varied significantly, with most students engaging for 30 minutes to 1 hour per session (40%), fewer engaging in longer study periods. This suggests that students rely on e-books for focused study tasks rather than prolonged reading sessions. Factors such as screen fatigue and reading preferences could contribute to these trends, supporting previous findings that students often perceive prolonged digital reading as challenging (Pierard et al., 2020). This highlights the need for efficient search tools and seamless navigation to support academic reading habits.

The experience levels with e-books also varied, with 35% of students having over five years of experience, while 13% were relatively new users. This indicates a well-established user base that is familiar with digital reading tools, yet a portion still requires adaptation and support. Universities could consider offering training programs to help students optimise their e-book usage.

Device preferences revealed a strong inclination toward laptops (52%), followed by desktops, tablets, and smartphones (15% each). The low usage of e-readers (3%) indicates that students prefer multifunctional devices for academic reading. Students predominantly use laptops for reading e-books due to their multitasking capabilities, keyboard accessibility, and larger screen size. Tablets and smartphones, though less common, are preferred for portability and quick

access. These findings align with research showing that laptops remain the most commonly used device for reading e-books, followed by tablets and smartphones (Miller et al., 2019).

The study also highlights a strong preference for PDFs (75%), which students favour for their stability across devices, ease of navigation, and annotation capabilities. This supports Islam (2018), who found that PDFs remain dominant due to their compatibility. However, alternative formats such as EPUB (18%), MOBI (4%) and HTML (4%) have limited adoption, suggesting a lack of awareness regarding their advantages, such as reflowable text and adjustable layouts.

Although this study did not analyse disciplinary differences in e-book usage, prior research suggests that STEM and business students engage with e-books more frequently due to their reliance on up-to-date digital content, whereas humanities students may prefer printed books for deep reading and critical analysis (Wilson et al., 2020). Future research could examine whether such differences exist in the context of Swedish university students. Overall, while e-books are a vital academic resource, reading habits, academic fields, and study preferences shape engagement. Enhancing annotation tools, offline access, and adaptive reading interfaces could improve usability and adoption across disciplines.

6.1.1.2 Factors influencing e-book adoption

Several factors influence the adoption of e-books among students, including prior experience with digital technologies (e.g., learning platforms, software, apps), accessibility, and institutional support.

Students' prior experience with digital technologies was generally viewed as supportive of their e-book use. As shown in figure 11, half of the respondents (50%) agreed and 11% strongly agreed that their prior experience with digital tools (such as learning platforms, software, or apps) made it easier and more effective for them to engage with e-books. A substantial share (38%) remained neutral, while only 1% expressed strong disagreement, and no respondents selected simple disagreement. This pattern suggests that negative perceptions were almost absent, indicating broad acceptance of the idea that digital familiarity facilitates e-book use. A majority of respondents agree that their prior experience with digital technologies increases their e-book usage, reinforcing TAM2's assertion that perceived ease of use (PEOU) influences technology adoption (Venkatesh & Davis, 2000). These findings therefore support the theoretical expectation that external variables, such as prior experience, shape users' perceptions and indirectly influence their technology adoption decisions. However, the large neutral group highlights that not all students explicitly connect their general digital experience to e-book practices, suggesting that the effect of digital competence may vary depending on the depth and type of prior exposure.

Access to e-books within university libraries was generally perceived as convenient, with 75% of respondents agreeing or strongly agreeing that access was easy. However, 10% of students reported difficulties, suggesting that some barriers to accessibility remain.

Additionally, students' academic level correlates with ease of access to e-books, indicating that more advanced students are likely to navigate digital platforms more efficiently. Universities should address these challenges by improving search functionalities, user interfaces, and awareness of available digital resources.

Regarding e-book provision, 54% of students were satisfied with the library's offerings, while 22% expressed dissatisfaction. This indicates that while institutional support is generally adequate, there is room for improvement in expanding digital collections to meet diverse academic needs. While most respondents find e-books accessible, a notable minority disagrees. This also suggests that while university libraries offer extensive collections, licensing restrictions, DRM limitations, or awareness gaps may hinder full accessibility (Wallin, 2019). Future research could explore whether dissatisfaction is linked to specific disciplines, as some fields may have more extensive digital resources than others.

6.1.1.3 Students' perceptions of e-books

Student satisfaction with e-books is generally high, with most respondents (70%) perceiving them as equally valuable or superior to printed books. This supports previous studies indicating that convenience and accessibility drive e-book preference (Hjertzell, 2022). 27% of respondents remained neutral, suggesting that while students appreciate the availability of e-books, they may not always find them superior to print books. Many students appreciate the ability to access e-books remotely, the option to search within texts, and the flexibility of digital annotations. However, there are still concerns regarding eye strain, navigation issues, and lack of interactivity, which limit the overall satisfaction of some users (DeNoyelles et al., 2015).

When comparing e-books to print books, 45% of students viewed them as equal in quality, while 41% considered e-books better. Some students (14%) prefer print books for deep reading and concentration, aligning with research suggesting that printed materials enhance cognitive retention and reduce digital fatigue in comparison to screen-based reading (Wu & Chen, 2011; DeNoyelles et al., 2015). This highlights the need for hybrid learning resources, allowing students to utilise both print and digital formats based on their preferences and learning needs. Future studies should explore how usability improvements in e-book platforms could enhance the reading experience and address concerns related to ergonomics and digital fatigue.

The study also found that 61% of students viewed e-books as more convenient than print books, reinforcing the advantages of digital access, portability, and searchability. However, 31% considered both formats equally convenient, indicating that print books still hold significant value. Only 8% of respondents found print books more convenient, suggesting that traditional reading preferences persist but are not dominant.

These findings contribute to the understanding of technology adoption in academic settings and highlight areas where institutional policies and library services could be improved to support e-book engagement.

6.1.1.4 Regression analysis results

The regression analyses provide valuable insights into the factors influencing students' satisfaction with e-books, e-book usage frequency, and access-related challenges. The findings highlight the significant role of digital tools and academic discipline in shaping students' experiences with e-books, while also revealing the limitations of other variables in explaining variations in satisfaction and usage patterns.

The regression results indicate a strong and statistically significant relationship between the **effect of digital tools** and students' **satisfaction** with e-books ($R^2 = 0.8130$, $p = 0.0365$). The model explains 81% of the variation in satisfaction, suggesting that digital tools play a crucial role in enhancing the e-book reading experience. The positive coefficient (0.7216) indicates that an improvement in digital tools is likely to increase satisfaction levels, reinforcing the importance of user-friendly interfaces, annotation tools, and accessibility features in e-book platforms. However, the non-significant intercept ($p = 0.4014$) suggests that other external factors may also influence satisfaction beyond digital tools.

While **ease of access** shows a positive correlation with e-book **satisfaction** ($R^2 = 0.7315$), the relationship is not statistically significant ($p = 0.1447$). Although ease of access accounts for 73% of the variation in satisfaction, the high p-value suggests that other factors may have a stronger impact on students' overall satisfaction. This finding underscores the complexity of e-book satisfaction, where elements like content quality, reading format, and digital literacy support may play a more decisive role.

The **provision of e-books** by university libraries shows a moderate positive correlation with **satisfaction** ($R^2 = 0.6190$), indicating that 62% of the variation in satisfaction can be attributed to library e-book availability. However, the relationship is not statistically significant ($p = 0.1144$). This suggests that while library resources contribute to satisfaction, factors such as availability of required materials, search functionality, and user-friendliness of library e-book platforms may need further examination. The relatively high intercept p-value (0.9233) reinforces the idea that students' satisfaction is influenced by more than just library provisions.

Experience with e-books demonstrates a moderate positive correlation with **session duration** ($R^2 = 0.5141$), indicating that 51% of the variation in reading time can be explained by users' familiarity with e-books. However, the relationship is not statistically significant ($p = 0.1728$). This suggests that while experience influences session duration to some extent, other factors such as study habits, academic workload, and device usability might play a significant role in determining how long students engage with e-books.

The relationship between students' **academic level** and **ease of access** to e-books is moderately strong ($R^2 = 0.4905$), explaining 49% of the variation in ease of access. However, the statistical insignificance of the results ($p = 0.2996$) suggests that academic level alone is not a primary determinant of how easily students can access e-books. This finding indicates that institutional

policies, digital infrastructure, and personal digital literacy may be more influential factors in determining accessibility.

Academic discipline is found to have a statistically significant effect on e-book **usage frequency** ($R^2 = 0.4672$, $p = 0.0070$). The model suggests that discipline-specific factors contribute to variations in usage, with some academic fields relying more on e-books than others. The strength of this relationship (significant at the 1% level) indicates that disciplinary differences in reading habits, availability of digital resources, and the nature of study materials are key determinants of how often students engage with e-books. However, the high p-value for the intercept (0.4265) implies that additional variables may also play a role in e-book usage beyond academic discipline.

The regression results underscore the critical role of digital tools and academic discipline in shaping e-book usage and satisfaction. While ease of access and library provisions contribute to satisfaction, their effects are not statistically significant, highlighting the need for further investigation into other influencing factors such as content availability, institutional support, and individual reading preferences. Moreover, the lack of significance in some models suggests that a multifaceted approach is required to enhance students' e-book experiences. Future research could explore qualitative aspects of e-book usage to complement these findings and provide a more comprehensive understanding of students' preferences and challenges in digital reading environments.

6.1.1.5 Hypothesis testing results

The hypothesis testing results provide valuable insights into students' e-book usage patterns, preferences, and influencing factors. The regression analysis for **hypothesis 1** revealed a strong positive correlation between digital tool exposure and e-book satisfaction, with a significant p-value of 0.036. This indicates that students familiar with digital learning environments are more adept at utilising e-books effectively. Similarly, **hypothesis 2** was supported, as institutional characteristics significantly influenced e-book usage frequency ($p = 0.00224$), suggesting that access to digital literacy support and library resources plays a crucial role in shaping students' engagement with e-books. Furthermore, the chi-square tests for **hypothesis 3 and 4** confirmed that laptops are the most preferred device for e-book reading ($p = 1.33 \times 10^{-22}$) and that PDFs are the overwhelmingly favoured format ($p = 6.49 \times 10^{-33}$), likely due to their accessibility, functionality, and widespread compatibility across devices.

However, **hypothesis 5,** which posited that graduate students would exhibit higher e-book engagement than undergraduates, was not supported, as no statistically significant difference was found between the two groups ($p = 1$). This suggests that academic level alone does not determine e-book usage, and other factors, such as institutional resources and study habits, may play a more significant role.

These findings highlight the importance of institutional support and digital literacy training in enhancing students' engagement with e-books, ensuring that library resources cater to a diverse range of student needs and preferences.

6.1.2 Theoretical implications: Application of TAM2

This study provides partial support for the Technology Acceptance Model 2 (TAM2) in explaining students' e-book adoption. The findings align with TAM2's emphasis on perceived ease of use (PEOU) and perceived usefulness (PU), as students who found e-books more accessible and beneficial were more likely to use them frequently. The preference for laptops and PDFs reinforces TAM2's assertion that users adopt technologies they find more efficient and user-friendly (Venkatesh & Davis, 2000).

However, some results challenge the model's assumptions. The hypothesis that greater exposure to digital learning tools would lead to higher satisfaction and e-book usage was not statistically significant, suggesting that external variables beyond TAM2's core constructs may influence adoption. Additionally, the expectation that graduate students would engage more frequently with e-books was not supported, indicating that factors such as study discipline, course requirements, and personal preferences may be more important than academic level alone.

To address these gaps, future research could integrate the Unified Theory of Acceptance and Use of Technology (UTAUT), which includes additional factors like facilitating conditions, social influence, and behavioural intent (Venkatesh et al., 2003). Expanding the theoretical framework in this way could provide a more comprehensive understanding of how different factors shape e-book adoption in academic settings.

6.1.3 Impact of methodological limitations on findings

As discussed in section 4.10, the study has certain methodological limitations that affect the interpretation of results. The use of self-selection sampling, particularly via Facebook recruitment, introduces selection bias, which may limit the representativeness of the sample. Gender imbalance at Luleå University and small sample sizes further reduce the reliability of institutional comparisons.

Additionally, statistical analyses encountered limitations in variable classification and regression modelling. Specifically, academic discipline was treated as a continuous variable instead of a categorical one, which may have affected the accuracy of regression estimates. Future studies should apply dummy coding or use logistic regression when analysing categorical predictors. Furthermore, the assumption that perceived availability of e-books directly influences satisfaction should be reconsidered, as satisfaction may be influenced by multiple interacting factors rather than a single predictor. Finally, the limited sample size constrained the inclusion of multiple predictors in regression models, which may have impacted the robustness of the findings.

The survey also contained inconsistencies in question labels and variable classifications, which may have introduced errors in data interpretation. Additionally, some academic disciplines had only one respondent, making statistical comparisons invalid. Future research should ensure consistent questionnaire design and group disciplines into meaningful categories to enable more reliable statistical analyses.

Future studies should address these limitations by employing randomised sampling, larger sample sizes, and refined statistical methodologies to enhance validity.

6.1.4 Contribution to LIS research

This study contributes to Library and Information Science (LIS) research by addressing gaps in knowledge related to university students' e-book adoption patterns in Sweden. While previous research (e.g., Wallin, 2019; Tattersall Wallin, 2024) has focused on e-books in public libraries and general academic settings, this study provides a targeted analysis of student behaviours within two university library environments.

The findings support TAM2 as a theoretical lens for studying e-book adoption but also highlight the importance of user experience (UX) design and accessibility in academic library services. Moreover, the study emphasises the need for personalised digital literacy initiatives to enhance students' ability to effectively navigate and utilise e-book resources.

Future LIS research should explore how academic libraries can optimise e-book services by integrating user-centered design principles, and interactive learning features to improve engagement and satisfaction among students.

6.2 Qualitative findings

The qualitative findings provide valuable insights into students' experiences with e-books and complement the quantitative results by highlighting the contexts in which e-books are perceived as useful or problematic. Several interrelated themes emerged-awareness of platforms, perceptions of quality relative to print, convenience and accessibility, and reported challenges-which can be interpreted within the Technology Acceptance Model 2 (TAM2) framework and existing research.

Awareness and navigation of e-book platforms

Many students reported uncertainty about the specific databases they used, relying primarily on the library catalogue to connect them to resources. This indicates that while infrastructure for access exists, user awareness is limited. In terms of TAM2, this weakens *perceived ease of use* and *output quality*, as students may not feel confident navigating resources independently. As Poortman and Schildkamp (2011) argue, systematic approaches to information use are essential for improving the reliability and efficiency of outcomes. The findings therefore

suggest that stronger training and clearer visibility of platforms would improve students' ability to benefit fully from available resources.

Perceptions of e-book quality relative to print

Students expressed both positive and negative views about e-books compared to print. On the positive side, e-books were valued for their search functions, portability, and ability to save time in academic work, reflecting strong *perceived usefulness*. At the same time, difficulties such as eye strain, lower visual quality, and less intuitive navigation indicated that e-books are not universally preferred for all tasks. These results align with the idea that technological tools may be accepted when they clearly support performance, but less so when they introduce new barriers (Davis, 1989; Venkatesh & Davis, 2000). This situational preference suggests that e-books often function as complements to, rather than substitutes for, print resources.

Convenience and accessibility

Convenience was one of the strongest motivators for e-book use. Students emphasised the value of being able to access texts at any time and from any location, which was especially important for distance learners and international students. This directly relates to TAM2's construct of *perceived usefulness*, since students saw e-books as improving their study performance by reducing time, cost, and logistical barriers. Accessibility in the form of inclusive formats further demonstrated how e-books can promote equity in higher education. These findings reinforce the argument that digital tools can enhance participation when they are designed to meet diverse needs.

Challenges and frustrations

Despite their advantages, students highlighted several persistent challenges. Limited access to required textbooks, technical problems such as session timeouts, and confusion between print and digital editions created frustration. These issues reduced both *perceived ease of use* and *perceived usefulness* and illustrate that the success of e-book adoption depends on the quality of system design and provision. As Davis (1989) noted, perceived usefulness and ease of use are critical determinants of technology acceptance; when either is undermined, adoption is constrained.

Suggestions for improvement

Students recommended expanding e-book collections, particularly for required course literature, improving the stability of e-book platforms, and providing training to strengthen digital literacy. These suggestions align with TAM2 in that institutional measures can increase acceptance by improving both usability and perceived usefulness. They also reflect the importance of careful planning and systematic support in research and educational settings (Poortman & Schildkamp, 2011).

Implications

Overall, the qualitative findings show that e-books are highly valued for academic efficiency, accessibility, and inclusivity, yet their full potential is not fully realised due to technical barriers, gaps in awareness, and limited availability of required texts. Addressing these challenges requires institutional strategies that strengthen digital literacy, improve system reliability, and ensure alignment between library provision and students' academic needs. By doing so, universities can enhance learning outcomes, promote equity of access, and ensure that investments in digital resources deliver maximum educational benefit.

7. Reflections around the shortcomings of the questionnaire

While the questionnaire provided valuable insights into students' e-book usage patterns and perceptions, certain shortcomings in its design have implications for the reliability and validity of the study. One notable issue pertains to the classification of academic disciplines, which probably led to confusion among respondents.

At the University of Borås, a significant number of students (19 students) selected 'Humanities' as their field of study. However, this classification does not align with the university's program offerings, as no programs at Borås are officially categorised as humanities. A likely explanation is that students in Textile design or related programs chose this option because it appeared to be the closest match to their field.

Reliability and validity concern: This misclassification suggests that some students may have interpreted the questionnaire categories differently than intended, leading to inconsistencies in the data. The ambiguity in the discipline classification undermines the accuracy of the data, as the responses may not accurately represent the students' academic backgrounds.

The predefined options for academic disciplines may not have adequately captured the specific fields of study available at the University of Borås. Terms such as 'Humanities' may have been interpreted more broadly by students unfamiliar with academic classifications.

To address these limitations in future studies, the following steps could be recommended:

- Tailoring the discipline options to reflect the specific academic programs offered at each university, ensuring that all fields are appropriately represented.

- To include clear definitions or examples for each discipline category to help respondents accurately identify their field of study.

- Adding an open-ended follow-up question allowing respondents to specify their program if none of the predefined options seem appropriate.

Despite these limitations, the findings remain valuable for understanding general trends in e-book usage among students. By reflecting on these shortcomings, this study contributes to improving the design and reliability of future research instruments in similar contexts.

8. Conclusions

This thesis set out to investigate e-book usage in Swedish universities, focusing on patterns of adoption, influencing factors, and students' perceptions of accessibility and effectiveness. Drawing on the Technology Acceptance Model 2 (TAM2), the study combined quantitative and qualitative approaches to provide a broad and nuanced understanding of how university students engage with e-books. Although limited in sample size and scope, the study contributes to the discussion on digital resource adoption in higher education and offers insights that may guide institutional strategies for enhancing digital learning environments.

The findings reveal that e-book usage among students is widespread but varied, with most respondents using e-books several times a month or week. Laptops emerged as the most common devices for accessing e-books, and the PDF format was strongly preferred, supporting hypotheses related to established usage patterns. At the same time, students highlighted usability challenges, including screen fatigue, difficulties in navigation, and limited awareness of available e-book collections. These barriers confirm that access alone does not guarantee effective adoption.

The study also identified institutional and individual factors shaping adoption. Institutional support, such as digital literacy training and well-structured library services, was found to be closely linked to perceived ease of use and perceived usefulness. Students with prior experience of digital learning tools or exposure to supportive learning environments reported higher satisfaction with e-books and greater frequency of use. Social influence, particularly from peers and faculty, also played a role in normalising e-book adoption. These findings are consistent with TAM2's emphasis on facilitating conditions, social norms, and cognitive processes in shaping behavioural intentions.

Perceptions of e-books were generally positive, with many students acknowledging their convenience, accessibility, and value as academic resources. However, preferences for print materials persisted, especially for intensive reading and study. Notably, the study found no significant difference in usage between undergraduate and graduate students, meaning hypothesis 5 was not supported.

Taken together, the results highlight a key tension in digital learning environments: while e-books expand opportunities for flexible and cost-effective access to information, their adoption is constrained by usability issues, limited awareness, and entrenched preferences for print. Addressing these challenges requires not only expanding collections but also enhancing user training, improving platform design, and integrating e-books more deeply into curricula.

From a theoretical perspective, the study demonstrates the relevance of TAM2 for understanding e-book adoption in higher education. By linking perceived usefulness, ease of use, social influence, and facilitating conditions with students' behavioural intentions, the model provided a robust framework for interpreting both quantitative and qualitative findings.

Finally, the study's limitations must be acknowledged. The small and uneven sample, and low response rate restrict the generalisability of results. Nonetheless, the mixed-methods approach ensured that findings, while indicative rather than representative, captured both measurable

patterns and subjective experiences. Future research should therefore aim to include larger, more representative samples, apply stratified sampling techniques, and conduct longitudinal analyses to capture evolving trends in digital resource adoption. It should also be noted that the study relied on self-selection sampling, whereby participation was voluntary and based on students' awareness of the survey. While this approach enabled ethical and accessible data collection, it limits the generalisability of the findings and suggests that the results should be interpreted as indicative rather than representative.

In conclusion, this thesis shows that students' engagement with e-books in Swedish universities is shaped by a combination of technological, institutional, and personal factors. While e-books are valued for their accessibility and flexibility, their effective integration into higher education requires continuous efforts from libraries, universities, and faculty to reduce barriers, enhance digital literacy, and align digital resources with students' academic needs. By addressing these challenges, institutions can better support students in making full use of e-books as essential tools for learning and research in the digital age.

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Appendix 1: Survey questionnaire

Questionnaire

Survey on Use of E-books: A Comparative Analysis of Using e-books in University Libraries by the Students.

My name is Mohammad Habibur Rahman. I am studying at the University of Borås and doing there master's programme: Library and Information Science-Digital Library and Information Services. I am currently writing my master's thesis and the purpose of this survey is to explore usage of e-books in university libraries by the students. The survey is anonymous and in accordance with the Data Protection Regulation (GDPR). The data will be used to evaluate and check the present status of using e-books in university libraries. The results of the survey will be written down in a research paper. Giving consent to the survey is completely voluntary and you can decide whether you will participate or not in the survey. If you have any questions about the survey, please do not hesitate to email me: habib.umu77@gmail.com.

Your years of experience with e-books:

- Less than 1 year
- 1-2 years
- 3-5 years
- More than 5 years

E-book usage patterns:

1. How often do you use e-books for your academic purposes?
   - Daily
   - Several times a week
   - Once a week
   - Several times a month
   - Rarely

2. How would you describe your typical session duration when using e-books for academic purposes?
   - Less than 15 minutes
   - 15-30 minutes
   - 30 minutes to 1 hour
   - 1-2 hours
   - More than 2 hours

3. What types of devices do you use for reading e-books? (Select all that apply)

- Laptop
- Desktop computer
- Tablet
- E-reader
- Smartphone
- Other (please specify): ----------

4. What e-book formats do you prefer? (Select all that apply)
   - PDF
   - EPUB
   - MOBI
   - HTML
   - Other (please specify): ----------

5. In which languages do you read e-books?
   - English
   - Swedish
   - Other Nordic
   - Finnish
   - Other

Perceptions and Attitudes Towards E-books:

1. How would you rate your satisfaction with using e-books for academic purposes?
   - Very satisfied
   - Satisfied
   - Neutral
   - Dissatisfied
   - Very dissatisfied

2. Do you think e-books are helpful for your academic studies?
   - Yes
   - No

3. How do you find e-books for your academic study?
   - Through internet search function
   - Through academic library
   - Through internet bookshop
   - Through recommendations from others
   - Other (please specify):----------

4. How do you perceive the quality of e-books compared to traditional print books?
   - Better

- Equal
- Worse

Why?----------

5. Do you believe e-books are more convenient than print books for academic use?
   - Yes
   - No
   - Both are equally convenient

   Why?----------

6. How strongly you agree with the following: My university library provides all e-books necessary to my academic studies.
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree

7. How strongly you agree with the following: it is easy to access e-books through my university library.
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree

8. Which database in your university library do you use to get access to e-books? Please, indicate in the provided space its name or just write "I do not know" if this is the case.

Factors influencing e-book adoption:

1. What were the reasons that led you to use an e-book for your studies for the first time? (Select all that apply)
   - Availability of e-books
   - Ease of access
   - Cost
   - Device compatibility
   - Features of e-book platforms (e.g., highlighting, note-taking)
   - Recommendations from professors
   - Recommendation from fellow students
   - Language of the text

- Other (please specify): ----------

2. Availability of e-books through my university library (choose from the following: three items most important for you):
   - Reduces my expense on study materials
   - Speeds up access to study materials
   - Increases the number of books available for my studies
   - Helps to achieve higher quality of studies
   - Increases flexibility in choosing study place
   - Allow convenient choice of time for studies
   - Other (please specify):----------

3. Have you received any formal training or guidance on how to effectively use e-books for academic purposes? (choose what applies)
   - Yes, I have attended workshops or seminars on effectively using e-books for academic purposes.
   - No, I have not attended any formal training sessions on using e-books for academic purposes.
   - I have sought guidance from professors, librarians, or peers on using e-books for academic purposes.
   - I have participated in online courses or tutorials related to using e-books for academic purposes.
   - I have utilized resources provided by my educational institution (such as online guides or manuals) to learn about using e-books for academic purposes.

4. Do you agree with the following: My prior experience with digital technologies (e.g., learning platforms, software, apps) makes it easier and more effective for me to use e-books?
   - Strongly agree
   - Agree
   - Neither agree, nor disagree
   - Disagree
   - Strongly disagree

5. Which features of e-books do you find inconvenient?
   - Limited highlighting and annotation tools
   - Lack of page numbers
   - Incompatibility with devices
   - Poor formatting or layout
   - Complex navigation
   - Limited print options
   - Accessibility issues
   - Other (please specify):----------

General feedback:

Please share any other comments or suggestions you may have regarding your experience with e-book in the university library.

Demographic information:

1. Please indicate your gender:
   - Male
   - Female

2. Age:
   - 18-21
   - 22-25
   - 26-30
   - Over 30

3. Academic Level:
   - Undergraduate
   - Graduate
   - Other (please specify):----------

4. Academic Program/Major:
   - Humanities
   - Social Sciences
   - Natural Sciences
   - Engineering
   - Other (please specify): ----------

5. University Library Affiliation:
   - University of Borås
   - Umeå University
   - Luleå University of Technology

Thank you for participating in the study! Your feedback is valuable in understanding and improving the user experience in university libraries.

Appendix 2: Detailed mapping of survey questions to research questions and TAM2 constructs

Survey question	Research question	TAM2 construct
How often do you use e-books?	What are the specific patterns of e-book usage?	PU
How long is your typical e-book reading session?	What are the specific patterns of e-book usage?	PU
What types of devices do you use for reading e-books?	What are the specific patterns of e-book usage?	PEOU
What e-book formats do you prefer?	What are the specific patterns of e-book usage?	PEOU
In which languages do you read e-books?	What are the specific patterns of e-book usage?	External Factors
How satisfied are you with using e-books?	What are students' perceptions of e-books?	PU
Do you think e-books are helpful for your studies?	What are students' perceptions of e-books?	PU
How do you find e-books for your academic study?	What are students' perceptions of e-books?	External Factors
How do you perceive the quality of e-books compared to print books?	What are students' perceptions of e-books?	PU

Do you believe e-books are more convenient than print books?	What are students' perceptions of e-books?	PEOU
Does your university library provide all e-books necessary for your studies?	What factors contribute to variations in e-book usage?	External Factors
Is it easy to access e-books through your university library?	What factors contribute to variations in e-book usage?	PEOU
Which database in your university library do you use for e-books?	What factors contribute to variations in e-book usage?	External Factors
What led you to use an e-book for the first time?	What factors contribute to variations in e-book usage?	Social Influence
Have you received formal training on using e-books?	What factors contribute to variations in e-book usage?	External Factors
Has your experience with digital tools influenced your e-book usage?	What factors contribute to variations in e-book usage?	PEOU
What e-book features do you find inconvenient?	What factors contribute to variations in e-book usage?	PEOU
Have recommendations from professors or peers influenced your e-book usage?	How do social factors impact e-book adoption?	Social Influence

Appendix 3: Data analysis in Excel

Regression analysis

1	Effect of digital tools	Satisfaction with e-books
	9	22
	43	38
	33	23
	0	3
	1	0

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.90165203
R Square	0.81297638
Adjusted R Square	0.75063518
Standard Error	7.84336039
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	802.2450935	802.245093	13.0407548	0.03647281
Residual	3	184.5549065	61.5183022		
Total	4	986.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	4.78894081	4.910746377	0.97519612	0.40138626	-10.839246
X Variable 1	0.72157321	0.199815436	3.61119852	0.03647281	0.08567131

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	11.2830997	10.71690031
2	35.8165888	2.183411215
3	28.6008567	-5.600856698
4	4.78894081	-1.78894081
5	5.51051402	-5.510514019

2

Ease of accessing e-books	Satisfaction with e-books
17	22
47	38
13	23
9	3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.85529711
R Square	0.73153315
Adjusted R Square	0.59729972
Standard Error	9.10066066
Observations	4

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	451.3559511	451.355951	5.44970923	0.14470289
Residual	2	165.6440489	82.8220245		
Total	3	617			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	6.26585095	7.955572606	0.78760527	0.51344574	-27.964215
X Variable 1	0.70856507	0.303524027	2.33446123	0.14470289	-0.5973934

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	18.3114572	3.688542825
2	39.5684093	-1.568409344
3	15.4771969	7.522803115
4	12.6429366	-9.642936596

3 Effect of digital tools

E-book usage frequency
4
23
17
26
16

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.18472925
R Square	0.03412489
Adjusted R Square	-0.2878335
Standard Error	9.60924867
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	9.78701973	9.78701973	0.10599164	0.76614007
Residual	3	277.0129803	92.3376601		
Total	4	286.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	15.8291796	6.016373185	2.63101692	0.07825676	-3.317605
X Variable 1	0.07969886	0.244802753	0.32556357	0.76614007	-0.6993728

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	16.5464694	-12.54646937
2	19.2562305	3.74376947
3	18.459242	-1.459241952
4	15.8291796	10.17082035
5	15.9088785	0.091121495

4

Ease of accessing e-books	E-book usage frequency
17	4
47	23
13	17
9	26
0	16

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.20688473
R Square	0.04280129
Adjusted R Square	-0.2762649
Standard Error	9.56599167
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	12.27540984	12.2754098	0.13414547	0.73847751
Residual	3	274.5245902	91.5081967		
Total	4	286.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	15.5081967	6.29588484	2.46322751	0.09060738	-4.5281187
X Variable 1	0.09836066	0.268555106	0.36625874	0.73847751	-0.7563015

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	17.1803279	-13.18032787
2	20.1311475	2.868852459
3	16.7868852	0.213114754
4	16.3934426	9.606557377
5	15.5081967	0.491803279

5	Convenience of e-books	Satisfaction with e-books
	52	22
	7	38
	27	23
	0	3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.18131583
R Square	0.03287543
Adjusted R Square	-0.4506869
Standard Error	17.2730406
Observations	4

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	20.28413962	20.2841396	0.06798592	0.81868417
Residual	2	596.7158604	298.35793		
Total	3	617			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	19.1037967	12.61130672	1.51481501	0.2690377	-35.158277
X Variable 1	0.11145132	0.427440531	0.26074111	0.81868417	-1.7276768

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	24.8992652	-2.899265156
2	19.8839559	18.11604409
3	22.1129822	0.887017759
4	19.1037967	-16.10379669

6	Respondents' experience with e-books	E-book usage frequency
	11	4
	20	23
	25	17
	30	26
	0	16

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.56996151
R Square	0.32485613
Adjusted R Square	0.09980817
Standard Error	8.03391277
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	93.16873677	93.1687368	1.44349732	0.31577375
Residual	3	193.6312632	64.5437544		
Total	4	286.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	10.2265349	6.826215644	1.49812656	0.23103404	-11.49753
X Variable 1	0.40543402	0.337452144	1.20145633	0.31577375	-0.6684893

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	14.6863091	-10.6863091
2	18.3352152	4.664784757
3	20.3623853	-3.362385321
4	22.3895554	3.610444601
5	10.2265349	5.773465067

7	Respondents' experience with e-books	Session duration in using e-books
	11	5
	20	15
	25	34
	30	22
	0	10

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.71700446
R Square	0.5140954
Adjusted R Square	0.3521272
Standard Error	9.09578786

Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	262.5999294	262.599929	3.17405143	0.17284202
Residual	3	248.2000706	82.7333569		
Total	4	510.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.49258998	7.72846447	0.71069615	0.52854204	-19.102833
X Variable 1	0.68066337	0.382054573	1.78158677	0.17284202	-0.5352048

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	12.9798871	-7.979887085
2	19.1058574	-4.105857445
3	22.5091743	11.49082569
4	25.9124912	-3.912491179
5	5.49258998	4.507410021

8	Library e-books provision	Satisfaction with e-books
	10	22
	36	38
	21	23
	18	3
	1	0

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.78674993
R Square	0.61897546

Adjusted R Square	0.49196727
Standard Error	11.195163
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	610.8049795	610.804979	4.87350853	0.11435713
Residual	3	375.9950205	125.331674		
Total	4	986.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	0.93204452	8.908949676	0.1046189	0.92328054	-27.420209
X Variable 1	0.94581136	0.428433738	2.20760244	0.11435713	-0.417656

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	10.3901582	11.60984183
2	34.9812537	3.018746339
3	20.7940832	2.205916813
4	17.9566491	-14.95664909
5	1.87785589	-1.877855888

9	Academic level	Esae of accessing e-books
	43	17
	43	47
	0	13
	0	9

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.70038921
R Square	0.49054505

Adjusted R Square	0.23581758
Standard Error	15.132746
Observations	4

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	441	441	1.92576419	0.29961079
Residual	2	458	229		
Total	3	899			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	11	10.70046728	1.02799249	0.41202527	-35.040395
X Variable 1	0.48837209	0.351924324	1.38771906	0.29961079	-1.0258361

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	32	-15
2	32	15
3	11	2
4	11	-2

10	Academic discipline	Esae of accessing e-books
	19	17
	20	47
	1	13
	31	9
	1	0
	1	0
	1	0
	1	0
	6	0
	1	0
	1	0
	1	0
	1	0
	1	0

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.61892819
R Square	0.3830721
Adjusted R Square	0.33166145
Standard Error	10.6825546
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	850.3106213	850.310621	7.45121962	0.01827691
Residual	12	1369.403664	114.116972		
Total	13	2219.714286			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	1.05542752	3.409505767	0.3095544	0.76220918	-6.3732474
X Variable 1	0.82818622	0.30339912	2.72969222	0.01827691	0.16713632

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	16.7909657	0.20903434
2	17.6191519	29.38084812
3	1.88361374	11.11638626
4	26.7292003	-17.72920028
5	1.88361374	-1.883613736
6	1.88361374	-1.883613736
7	1.88361374	-1.883613736
8	1.88361374	-1.883613736
9	6.02454483	-6.024544826

10	1.88361374	-1.883613736
11	1.88361374	-1.883613736
12	1.88361374	-1.883613736
13	1.88361374	-1.883613736
14	1.88361374	-1.883613736

11

Academic discipline	E-book usage frequency
19	4
20	23
1	17
31	26
1	16
1	0
1	0
1	0
6	0
1	0
1	0
1	0
1	0
1	0

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.68354307
R Square	0.46723112
Adjusted R Square	0.42283372
Standard Error	7.41291468
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	578.2986369	578.298637	10.5238383	0.00703365
Residual	12	659.4156488	54.9513041		
Total	13	1237.714286			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	1.9473381	2.365948632	0.82306863	0.42652338	-3.2076211
X Variable 1	0.68299147	0.210536888	3.24404659	0.00703365	0.224271

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	14.9241761	-10.92417608
2	15.6071676	7.39283245
3	2.63032957	14.36967043
4	23.1200737	2.87992625
5	2.63032957	13.36967043
6	2.63032957	-2.630329569
7	2.63032957	-2.630329569
8	2.63032957	-2.630329569
9	6.04528693	-6.045286932
10	2.63032957	-2.630329569
11	2.63032957	-2.630329569
12	2.63032957	-2.630329569
13	2.63032957	-2.630329569
14	2.63032957	-2.630329569

Hypotheses and Chi-square tests

Hypothesis 1: Students with greater exposure to digital learning tools will exhibit higher satisfaction and more frequent e-book usage.

Hypothesis 2: E-book usage frequency will vary based on institutional characteristics, including library resources and digital literacy support.

Hypothesis 3: Laptops will be the most used device for reading e-books in university libraries.

Hypothesis 4: PDFs will be the preferred file format among students due to accessibility and functionality.

Hypothesis 5: Undergraduate and graduate students will demonstrate different e-book usage patterns, with graduate students showing higher engagement.

Hypothesis 1: (Here, P-value was calculated through regression analysis of two variables)

Effect of digital tools	Satisfaction with e-books
9	22
43	38
33	23
0	3
1	0

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.90165203
R Square	0.81297638
Adjusted R Square	0.75063518
Standard Error	7.84336039
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	802.2450935	802.245093	13.0407548	0.03647281
Residual	3	184.5549065	61.5183022		
Total	4	986.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	4.78894081	4.910746377	0.97519612	0.40138626	-10.839246
X Variable 1	0.72157321	0.199815436	3.61119852	0.03647281	0.08567131

Chi-square tests

(Total number of observations was divided by the number of categories to get the expected value).

Hypothesis 2:

Category	Observed value	Expected value
Daily	4	17.2
Several times a week	23	17.2
Once a week	17	17.2
Several times a month	26	17.2
Rarely	16	17.2
Total	86	
	p-value	0.0022357

Hypothesis 3:

Category	Observed value	Expected value
Laptop	82	31.6
Desktop computer	24	31.6
Tablet	24	31.6
E-reader	5	31.6
Smartphone	23	31.6
Total	158	
	p-value	1.32993E-22

Hypothesis 4:

Category	Observed value	Expected value
PDF	83	27.75
EPUB	20	27.75
MOBI	4	27.75
HTML	4	27.75
Total	111	
	p-value	6.49295E-33

Hypothesis 5:

Category	Observed value	Expected value
Undergraduate	43	43
Graduate	43	43
Total	86	
	P-value	1